

**LIVING SUCCESSFULLY WITH PAIN: THE
ROLE OF ILLNESS REPRESENTATIONS,
CATASTROPHISING AND ACCEPTANCE
IN CHRONIC PAIN FUNCTIONING**

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SIGNED DECLARATION

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ABSTRACT

Introduction

In the past fifty years psychological factors have been shown to influence adjustment to chronic pain. Research demonstrates that individuals' internal representations of pain and the processes of catastrophising (focusing on negative outcomes) and acceptance (acknowledging pain but continuing to live a fulfilling life) are important. The aim of the present study is to examine how the processes of catastrophising and acceptance interact with illness representations to influence physical and emotional functioning.

Method

The psychological and functioning variables were assessed using validated questionnaires completed by individuals attending NHS Pain Clinics and pain support groups in the community. Path analyses were conducted to investigate whether catastrophising or acceptance mediated relationships between illness representations and emotional and physical functioning.

Key results

Catastrophising mediated the relationship between other psychological factors (representations of control, emotional responses to pain, acceptance) and emotional

functioning. Acceptance mediated the relationship between other psychological factors (perceptions of consequences, catastrophising) and physical functioning.

Discussion

The findings suggest that different psychological processes may underlie successful emotional and physical functioning in chronic pain. The clinical and theoretical implications of the results are discussed, as are directions for future research including the need for the development of experimental designs and intervention studies. This research would help clarify the causal status of catastrophising and acceptance in chronic pain and thereby advance psychological theory about successful functioning.

CHAPTER ONE: INTRODUCTION

INTRODUCTION TO CHRONIC PAIN

Definition

Pain has been defined ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage’ (IASP, 1994, p.209). Pain is a subjective experience, therefore if an individual reports their experience of pain in the same way as pain resulting from physiological damage, it should be accepted as pain whether or not there is evidence of damage. Pain becomes chronic when it persists beyond the expected time of healing or usual course of acute disease, usually taken to be a period of three months (IASP, 1994). Chronic pain may last indefinitely with detrimental effects on emotional and physical functioning and serious psychosocial consequences for individuals and their families.

Prevalence

Chronic pain is far more common than previously thought. In a systematic review including data from several developed countries, the mean prevalence of chronic pain in the population is found to be approximately 36 per cent with estimates ranging from 11.5 per cent to 55.2 per cent (Harstall & Ospina, 2003). Higher proportions of females suffer from chronic pain than men and there are higher prevalence rates in older adults

(an estimated prevalence of 50.2 per cent in the over-65s population). In the North-East of Scotland nearly half of the population sampled in a community-based survey experienced chronic pain, with back and arthritic pain being most common (Elliot, Smith, Penny et al., 1999). In a later study Smith, Elliot, Chambers et al. (2001) state that significant and severe chronic pain is associated with poorer physical health, interference with daily activities and higher levels of unemployment.

Current issues in chronic pain

Chronic pain conditions make massive demands on healthcare resources. Blyth, March, Brnabic et al. (2004) report that chronic pain which highly interferes with daily activities is associated with a two-fold increase in hospitalisation and GP visits and a five-fold increase in the number of emergency department visits, when compared to those with no pain. This is after the effects of known predictors of chronic pain including age, gender, general health and psychological distress have been accounted for. In 1998 the direct healthcare cost of back pain in the United Kingdom was estimated to be £ 1.6 billion (Maniadakis & Gray, 2000). The total cost, when informal care and related economic costs were added on, was thought to be nearer £ 10.7 billion. It is therefore no surprise that chronic pain is becoming a major public health issue throughout the world (Brennan & Cousins, 2004). In addition, the issue of suicidality in chronic pain has recently been highlighted. Tang & Crane (2006) review the literature and conclude that the risk of death by suicide is doubled in chronic pain patients when compared with controls. The

general prevalence of suicidal ideation in this client group is 20 %. These findings may in part be explained by the increased incidence of clinical depression in individuals with chronic pain.

Some now argue that pain relief is a fundamental human right as well good clinical and ethical practice (Brennan & Cousins, 2004; Cousins, Brennan & Carr, 2004). Inadequate treatment of pain is common and this been described as constituting a form of negligence (Brennan & Cousins, 2004). Treatment deficiencies continue to exist despite increasing academic knowledge about the nature and physiology of pain. In order to improve this situation, there are calls for chronic pain to be thought of as a disease or condition in its own right, rather than simply a symptom of disease (Cousins et al., 2004; Loeser, 2005).

The potential importance of early intervention in chronic pain is now also being emphasised. One study reports that cognitive-behavioural intervention for females with musculoskeletal pain is significantly more effective when participants have been out of work for a shorter period of time (less than 6 months) (Marhold, Linton & Melin, 2002). Keefe, Rumble, Scipio et al (2004) argue that further research is needed to examine the impact of early intervention on ongoing disease status as well as the effect of early intervention on how individuals view themselves and are viewed by their family and health professionals. It may be that early intervention in chronic pain can prevent a great deal of pain-related disability and distress. Unfortunately, the vast majority of

clinical pain services do not currently have the resources to implement or examine the impact of early intervention.

MODELS AND TREATMENT APPROACHES IN CHRONIC PAIN

The biomedical model

Early understanding of pain conformed to a biomedical model that dates back to the ancient Greeks and Descartes in the 17th century (Turk, 1996). According to a strictly biomedical model there is a simple, fixed and direct relationship between tissue damage and pain perception. Psychological and emotional symptoms are secondary consequences of pathophysiology (Turk, 1996). There are several serious problems with this model including the fact that it cannot explain the existence of chronic pain, where it is now recognised that pain severity and related disability cannot be accounted for solely by the extent of damage or disease (Eccleston, 2001). Recent understanding suggests that psychological and social factors have an important role in the development and progression of chronic health conditions such as chronic pain (Walker, Jackson & Littlejohn, 2004; Turk, 2004). The biomedical model prioritises biological and disease factors and cannot take account of the complex interaction between psychological, social and biological factors in pain processes.

Gate control theory and the biopsychosocial model

Recent conceptualisations of chronic pain constitute a significant paradigm shift from the biomedical model. In the 1960s a major challenge to the biomedical model came in the form of the gate control theory of pain, developed by Melzack and colleagues.

Melzack & Wall (1965) hypothesise the existence of a gating mechanism in the dorsal horn of the spinal cord that modulates sensory input and, importantly, signals from the brain. Gate control theory highlights the importance of psychological factors by theorising that the brain and central nervous system mechanisms are key components in pain processing. Psychological processes as well as memories of pain and past learning are thought to significantly influence pain experience. The advent of gate control theory revolutionised understanding of pain and paved the way for the development of a biopsychosocial perspective towards chronic pain.

The biopsychosocial model conceptualises chronic pain as an ongoing and complex multidimensional process with dynamic and reciprocal interplay between biological, psychological and social factors. In this model, no single factor can explain individuals' experiences of pain (Turk, 1996; Turk & Okifuji, 2002). In recent years Melzack has argued that there is a complex neural matrix, a widespread network of neurons linking different parts of the brain, which modulates pain processing and perception, and can explain phenomenon such as phantom limb pain (Melzack, 1990; Melzack, 1999). In the 1990s, neuroimaging techniques e.g. functional magnetic resonance imaging (fMRI)

have found evidence of the existence of such a matrix, often termed the 'pain matrix'. Therefore despite adjustment and revision over the years, gate control theory remains a cornerstone of contemporary understanding of pain processing. The theory has also led to remarkable advances in psychological treatments approaches to chronic pain (Turk, 1996).

Operant conditioning and behavioural treatment of chronic pain

The first wave of psychological treatments was based on operant conditioning and behavioural analysis. The importance of operant conditioning in chronic pain was established by Fordyce (Fordyce, 1976; Fordyce, Lansky, Calsyn et al., 1984). Pain behaviours are hypothesised as being maintained by environmental contingencies in the form of positive reinforcement and/or indirect reinforcement through the avoidance of situations that might increase pain. Behavioural treatment programmes therefore focus on increasing reinforcement of 'well' behaviours and reducing pain behaviour, healthcare utilisation and levels of inactivity. A major criticism of the operant conditioning model is that it ignores the importance of individuals' beliefs and the cognitive processes involved in chronic pain experience.

Cognitive models of chronic pain

Cognitive approaches to chronic pain have received a great deal of attention in the past 20 years. The importance of thoughts, beliefs and appraisals in pain experience has been demonstrated by experimental intervention, where manipulation of the meaning given to a mildly painful stimulus influences experienced pain intensity in students (Arntz & Claasens, 2004). In a sample of chronic pain patients, pain beliefs and cognitions have been shown to significantly predict general activity levels and emotional distress after controlling for pain severity. Negative thoughts and negative self-statements in particular are found to influence outcome (Stroud, Thorn, Jensen et al., 2000).

Negative beliefs in the form of fear of movement or (re)injury are the basis for the fear-avoidance model of chronic musculoskeletal pain (Vlaeyen, Kole-Snijders, Boeren et al., 1995). In this model negative appraisals and cognitive processes, e.g. catastrophising about pain, can lead to fear of pain and consequent avoidance of potentially painful situations as well as hypervigilance to bodily sensations, deconditioning of muscles and depression. Further research (Crombez, Vlaeyen, Heuts et al., 1999; Vlaeyen & Linton, 2000; Woby, Watson, Roach et al., 2004) demonstrates that fear-avoidance is involved in the development and maintenance of chronic pain disability.

One of the strengths of this research is that it has started to examine the relationships between fear-avoidant beliefs and psychological factors such as appraisals of control and

catastrophising about pain. A significant body of research has already accumulated on catastrophic thinking in chronic pain. Catastrophising has been shown to predict increased pain intensity and emotional distress (Sullivan, Bishop & Pivik, 1995). Pain-related anxiety has also been shown to influence chronic pain functioning (McCracken, Faber & Janeck, 1998; McCracken, Spertus, Janeck et al., 1999; Strahl, Kleinknecht & Dinnel, 2000).

Cognitive-behavioural treatment of chronic pain

Cognitive models of pain processing have developed in parallel with cognitive-behavioural treatment approaches for disability and distress in chronic pain. The cognitive-behavioural (CBT) perspective positions individuals as active agents who can regain control over their pain experiences by developing strategies to manage unhelpful thoughts (e.g. fearful or catastrophic thinking), feelings and behaviour (Turk, 2003). Psychoeducation, activity scheduling and cognitive reframing are used to increase individuals' resources to manage their pain (Eccleston, 2001).

A systematic review and meta-analysis of randomised controlled trials of cognitive-behavioural and behavioural treatments for chronic pain concludes that these treatments are effective when compared to waiting list control conditions (Morley, Eccleston & Williams, 1999). A Cochrane review of psychological treatments for chronic low-back pain demonstrates similar results. However the long-term efficacy of these treatments remains unknown and no significant differences are found between behavioural therapy

and exercise therapy (Ostelo, van Tulder, Vlaeyen et al., 2005). Turk (1990) suggests that the effectiveness of psychological treatments for chronic pain can be improved by customising interventions according to patient characteristics. A later study provides support for this hypothesis (Turk, Okifuji, Sinclair et al., 1998). Sub-groups of patients with fibromyalgia (a multisymptomatic condition, the key features of which are widespread chronic pain and extreme fatigue) who have different patient characteristics respond differently to a standard multidisciplinary treatment programme. Those with poor coping levels and high pain interference demonstrate significant improvements in outcome after treatment whilst those with interpersonal difficulties respond poorly to the same treatment approach.

Therefore cognitive models and CBT have improved understanding and treatment of chronic pain conditions. However the long-term effectiveness of CBT has yet to be proven and a considerable number of chronic pain patients that present in clinical settings fail to respond to a standard CBT approach.

Acceptance-based treatment approaches

Recently, a third wave of cognitive and behavioural therapies has developed. These new therapies are more open to past clinical traditions and are more experiential in nature, emphasising themes such as acceptance, mindfulness and spirituality (Hayes, 2004). Acceptance-based treatment approaches are gaining credence in chronic pain as a result of the work of McCracken and colleagues (e.g. McCracken & Eccleston, 2003; McCracken & Eccleston, 2006). A preliminary study examining the effectiveness of acceptance-based treatment for complex, longstanding chronic pain patients demonstrates significant improvements in emotional and physical functioning after intervention and at follow-up (McCracken, Vowles & Eccleston, 2005). These are promising results and, given the complex problems of the client group and maintenance of improvements at follow-up, suggest that acceptance-based approaches may overcome some of the shortcomings of standard cognitive-behavioural treatments.

Advancing psychological theory in chronic pain

In the past fifty years research has examined various psychological concepts such as fear-avoidance, pain catastrophising and acceptance. These processes all appear to influence whether individuals can learn to live successfully with chronic pain. Keefe et al. (2004) evaluate the past twenty years of this research and argue that these

psychological concepts are probably inter-related. More research is therefore needed to reveal what psychological concepts are most important and how they interact with each other.

Psychological research in chronic pain has also tended to focus on pain-specific variables. It is important to examine how these variables are related to psychological concepts and models that have developed in related fields such as mental health or health psychology. A model that has received much attention in health psychology research is Leventhal, Diefenbach & Leventhal's (1992) common-sense model of illness cognition. Illness representations, individuals' appraisals and understanding of their illness experiences, have been researched extensively and found to influence adjustment and functioning in a variety of chronic conditions including chronic pain. Individuals' representations of their chronic pain may well also influence the development of catastrophic thinking and their ability to accept their situation.

ILLNESS REPRESENTATIONS

Research on illness representations has developed in the context of the widespread influence of cognitive approaches in health and clinical psychology. A basic premise of the cognitive approach is that individuals create internal models, schemas or representations based on their interpretation of previous experiences. These representations guide interpretation, judgement and behaviour in new situations

(Weinman & Petrie, 1997). Illness representations derive from the common-sense model of illness cognition.

The common-sense model of illness cognition (Self-regulatory model: SRM)

The common-sense model (SRM) was developed by Leventhal and others in order to conceptualise some of the dynamic processes involved in adaptation to health threats (Leventhal, Meyer & Nerenz, 1980; Leventhal et al., 1992; Leventhal, Benyamini, Brownlee et al., 1997). Individuals interpret symptoms or somatic sensations and generate illness representations based on their prior experiences and sociocultural beliefs. These cognitive and emotional representations are used to try to make sense of symptoms, initiate behavioural responses and coping procedures and also to evaluate outcomes. Individuals select procedures in order to manage their illness representations e.g. if they think their illness will seriously affect their lives, they will be more likely to take medication to prevent the illness becoming worse. The common-sense model of illness cognition consists of two systems that process appraisals and associated emotions in parallel.

Leventhal et al. (1992) describe the cognitive processing system as creating an 'objective' representation of the health threat while the psychologically 'subjective' emotional processing system generates feeling states e.g. fear or hopelessness and leads to coping procedures for managing emotions. Emotional representations are the basis for

individuals' expressions of distress and for negotiation of their social environments in order to gain social support and assistance (Leventhal et al., 1997). The cognitive and emotional systems are thought to interact with each other as well as with coping procedures and outcome appraisals. One way the emotional system can influence the development of cognitive representations is by modifying attention to and interpretation of somatic information so that somatic states are seen as either harmless or catastrophic.

One of the strengths of the common-sense model is that it highlights the importance of both emotional and cognitive processing in illness cognition and resulting behaviour. Moreover it postulates informational input from schematic as well as conceptual or propositional memory structures, and therefore memories *of* illness episodes in addition to memories *about* illness episodes (Leventhal et al., 1992). This means that individuals' reflections and inferences about previous illness episodes, as well as their memory of what happened, influences processing of new health threats.

Dimensions of illness representations

Multidimensional scaling and open-ended interviews have been used to identify different dimensions of illness representations (Leventhal et al., 1992; Leventhal et al., 1997). Four dimensions of illness representations were initially proposed. These dimensions are identity (labels given to the illness and knowledge of the symptoms associated with it), consequences (including physical, social and economic consequences

and possible impact of the illness on daily life), perceived cause (including both biological and/or psychosocial causes) and timeline (whether the illness will have an acute or chronic course). Lau & Hartman (1983) propose another attribute of illness representations that has been incorporated as a fifth dimension. This is cure/controllability, a dimension that encompasses perceptions of empowerment regarding coping behaviours.

The applicability of the five factor structure of illness representations to different illnesses has been questioned in recent times. Heijmans & de Ridder (1998) examine the relevance of the five dimensions to chronic fatigue syndrome and Addison's disease and demonstrate different factor structures for each condition. They call for more research on illness representations from a disease-specific standpoint. Moss-Morris, Weinman, Petrie et al. (2002) revise the original Illness Perceptions Questionnaire (IPQ) that has been widely used in examining the effect of illness representations on illness adjustment. One reason for this revision is that the original scale does not assess emotional representations, thereby ignoring Leventhal's emotional processing route in the common-sense model. It has been demonstrated that emotional representations can be separated from general affect, indicating that the emotional representations scale in the revised questionnaire (IPQ-R) is not just a measure of mood (Moss-Morris et al., 2002). Instead emotional representations are individuals' emotional reactions and responses to their somatic sensations and in the context of the common-sense model lead to procedural and appraisal strategies for managing emotions. The IPQ-R also includes additional subscales assessing cyclical timeline (representations of whether the illness

has a stable or fluctuating course) and illness coherence (individuals' evaluations of the overall coherence or usefulness of their illness representations). There has been a great deal of research using both versions of the IPQ to examine the influence of different dimensions of illness representations on adjustment to a variety of acute and chronic conditions.

Illness representations and physical functioning in chronic illness

Scharloo, Kaptein, Weinman et al. (1998) analyse the influences of illness representations and coping on daily functioning in rheumatoid arthritis, chronic obstructive pulmonary disease and psoriasis. The results indicate that strong illness identity (more labels and symptoms associated with the illness) and a belief that the illness will last longer and have more serious consequences are related to poorer physical functioning. Both disease-specific measures and measures of general role and social functioning demonstrate this pattern of findings. The results suggest that illness representations have direct effects on functioning that are not mediated by coping variables. Horne and Weinman (2002) examine whether illness representations predict adherence to preventer medication in asthma patients. The results indicate that this is the case, with increased asthma identity and perceptions that asthma will have more serious effects on daily life predicting increased adherence. A review of the literature on illness representations in chronic conditions indicates that illness identity is consistently related

to outcome and other aspects of illness representations differentially predict outcome depending on the disease studied (Kaptein, Scharloo, Helder et al., 2003).

A longitudinal study by Petrie, Weinman, Sharpe et al. (1996) investigates whether patients' initial perceptions of their myocardial infarction (MI) predict later attendance at a cardiac rehabilitation programme, disability and work status. Patients' illness representations are assessed on hospital admission after their first infarction and three and six months later. The main results demonstrate that those who have stronger beliefs that their illness can be cured or controlled are more likely to attend the rehabilitation programme and those who feel their condition will last longer and have more serious consequences on their life take longer to return to work. In another study perceptions of increased control, as well as perceptions of increased consequences and longer duration of illness, predict attendance at a cardiac rehabilitation centre after MI or coronary artery bypass graft surgery (Cooper, Lloyd, Weinman et al., 1999). Further evidence for the influence of illness representations on physical functioning comes from evaluations of interventions based on the self-regulatory model. Psychological interventions that involve modifying illness representations and improving coping skills have been successful in improving self-management and functioning in diabetes, asthma and arthritis (Petrie, Broadbent & Meechan, 2003).

Illness representations and emotional functioning in chronic illness

Illness representations have also been found to influence emotional functioning in a variety of chronic illnesses. Kemp, Morley & Anderson (1999) examine the influence of illness representations and coping on psychological adjustment in a range of patients with epilepsy, from those recently diagnosed to those with chronic conditions. Illness representations are associated with psychological adjustment to epilepsy over and above the effects of neuroepileptic status and coping variables. The results indicate that those with a higher illness identity and those who feel their condition has more serious and widespread impact on their lives are more distressed. Goldstein, Holland, Soteriou et al. (2005) differentiate between anxiety and depression when examining the effects of illness representations, coping strategies and emotional functioning in epileptic patients. Illness identity is shown to independently predict anxiety and this relationship is not mediated by coping variables. On the other hand, coping mediates the relationship between illness representations and depression.

Page, Howard, Husain et al. (2004) examine the illness representations of anxious and depressed individuals with chronic daily headache. Their results support previous studies in that those who have clinically significant levels of anxiety and depression believe that their condition will have far more serious personal consequences and last longer. One problem with this research into illness representations is that the majority of studies have

a cross-sectional and correlational design, meaning that inferences about the causal status of illness representations in chronic illness outcome cannot be made.

The influence of illness representations on functioning in chronic pain

Hobro, Weinman & Hankins (2004) use illness representation dimensions to cluster newly referred chronic pain patients. Their analysis reveals the presence of two groups of patients which they name 'adaptors' and 'non-adaptors'. Patients in the 'adaptors' group believe that their pain will have a shorter duration and less impact on their lives than those in the 'non-adaptors' group. They feel that they have a more coherent overall understanding of their condition, are more in control and have less negative emotional reactions to their pain. They also report better physical and emotional functioning.

The relationship between illness representations and disease activity has recently been investigated over a three year period in women with rheumatoid arthritis (Grouarke, Curtis, Coughlan et al., 2005). The longitudinal design of this study allows examination of the causal nature of illness representations. The results support previous research by demonstrating a consistent relationship between illness representations and emotional and physical functioning. In particular high illness identity, perceptions of more serious consequences and lower levels of control predict poorer physical function and depression. Previous research has already shown a relationship between perceived control over pain and better functioning (Jensen, Turner, Romano et al., 1991; Turner &

Aaron, 2001). Of great interest in the study by Grouarke et al. (2005), illness representations do not predict adjustment later on when age, illness duration, disease status and earlier level of adjustment are taken into account. The best predictor of later adjustment is prior adjustment (Grouarke et al., 2005). This study suggests that, while illness representations are related to functioning in chronic pain, the nature of this relationship is unclear.

It may be that illness representations influence functioning through other psychological processes. Rankin & Holttum (2003) investigate the relationship between illness representations and acceptance in patients with chronic lower-back pain. Acceptance is shown to be negatively correlated to perceptions of more serious illness consequences and increased illness identity but there are no relationships between acceptance and perceptions of control and duration of pain. This study uses an acceptance scale (Felton & Revenson's (1984) Acceptance of Illness Scale) that has not been used widely in the chronic pain population. It would be useful to examine the relationship between illness representations and acceptance using the Chronic Pain Acceptance Questionnaire (CPAQ: McCracken, Vowles & Eccleston, 2004), the measure that has been used in recent research in acceptance of chronic pain.

Vlaeyen & Linton (2000) suggest that threatening illness representations may influence the development of catastrophic thinking in chronic pain. Similarly, Hobro et al. (2004) postulate that the self-regulatory model (SRM) and illness representations could be used to investigate the nature and development of catastrophising. Pain-related beliefs have

already been shown to predict patient adjustment to chronic pain (Turner, Jensen & Romano, 2000). In this study 'Illness Role' beliefs significantly predict both physical disability and depression after controlling for coping, pain intensity, sex and age. Interestingly, 'Illness Role' beliefs involve the belief that the pain will lead to disability, a serious illness consequence. These results therefore suggest that representations of pain consequences may also be directly related to physical and emotional functioning. However Turner et al. (2000) do not examine whether the relationships between illness representations and functioning are mediated by other psychological process such as acceptance or catastrophising.

PAIN CATASTROPHISING

Definitions of pain catastrophising

Pain catastrophising is one of the most researched of all the psychological variables thought to influence pain experience, and has been described as an 'exaggerated negative mental set' towards current or future experiences of pain (Sullivan, Thorn, Haythornthwaite et al., 2001, p. 2). Sullivan et al. (1995) conceptualise catastrophising as reflecting a tendency to focus excessively on pain sensations (rumination), exaggerate the seriousness of the pain condition (magnification) and perceive oneself as unable to manage the condition effectively (helplessness).

There is a lack of conceptual clarity about whether catastrophising is a stable personality construct or a response to pain that changes over time and across situations (Turner & Aaron, 2001). Studies that examine the reliability of pain catastrophising scales demonstrate high test-retest correlations, suggesting that levels of catastrophising do not change significantly over long periods of time (Keefe, Brown, Wallston et al., 1989; Sullivan et al., 1995). Turner, Mancl & Aaron (2004) examine the sequential relationship between catastrophising, pain severity and disability using an electronic interview method, with patients recording scores on brief pain-related measures several times a day. The results indicate that individual levels of pain catastrophising remain relatively stable over brief periods of time.

In another study the cross-situational consistency of catastrophising is examined by comparing catastrophising in a finger pressure task and during headache pain (Ellis & D'Eon, 2002). Almost half the participants remain catastrophisers or non-catastrophisers over both pain situations. In contrast Dixon, Thorn & Ward (2004) report that catastrophising scores before a cold pressor task do not correlate well with scores taken afterwards when modified instructions are given asking participants to think about their catastrophising during the task. This result suggests that levels of catastrophising vary depending on timing of assessment.

At present there is still more evidence for the stable, dispositional view of levels of pain catastrophising. However there has been little research that specifically examines the variable, situation-based conceptualisation of catastrophising. It may be that levels of

catastrophising vary depending on the social context e.g. depending on the way that information or prognoses are imparted to patients by health professionals.

The relationship between catastrophising and outcome in chronic pain

Correlational studies indicate that higher levels of pain catastrophising are associated with increased pain intensity and disability. Sullivan et al. (1995) report that catastrophising predicts pain intensity and emotional distress beyond the effects of depression, anxiety and fear of pain in a student sample carrying out a cold pressor immersion task. However this study involves pain-free students who volunteer to experience acute pain. The results are therefore difficult to generalise to the chronic pain population. More recently Severeijns, Vlaeyen, van den Hout et al. (2001) demonstrate that catastrophising significantly contributes to the variance of pain intensity, pain-related disability and distress in patients referred for pain management. Catastrophising remains a significant predictor of outcome when controlling for physical impairment and also across different subgroups of patients including those with chronic lower-back pain and other pain conditions. Similarly, catastrophising is the strongest predictor of quality of life in a mixed group of chronic pain patients (Lame, Peters, Vlaeyen et al., 2005). The results of another study suggest that the relationship between catastrophic thinking and pain-related disability is dependent on pain chronicity. Pain catastrophising is shown to predict disability in a group of patients with chronic pain lasting for more than four

years but not in patients with pain lasting for less than 2 years (Sullivan, Sullivan & Adams, 2002).

Catastrophising and depression in chronic pain

Catastrophising about pain has been shown to be related to depression (Geisser, Robinson, Keefe et al., 1994; Jensen et al., 1991). Turner et al. (2000) examine the independent influence of catastrophising on physical disability and depression. Their findings indicate that catastrophising independently predicts depression but not physical disability when controlling for other variables including coping, pain beliefs and pain intensity. The strong relationship between catastrophising and depression has led some researchers to question the distinction between the two constructs and suggest that catastrophising is simply a symptom of depression (Jensen et al., 1991; Sullivan & D'Eon, 1990). Affleck, Tennen, Urrowns et al. (1992) address this question using path analysis to examine mood, catastrophising and chronic pain in a sample of rheumatoid arthritis patients. The relationship between catastrophising and chronic pain ratings is no longer found to be significant when levels of depression are controlled for. In contrast, Geisser et al. (1994) demonstrate that catastrophising significantly mediates the relationship between depression and the affective and evaluative aspects, but not the sensory aspects of pain experience.

Catastrophising scores have also been shown, albeit modestly, to predict later depression when initial level of depression is controlled for (Keefe et al., 1989; Keefe, Caldwell, Williams et al., 1990). Taken as a whole, the literature suggests that catastrophising and depression are separate constructs, but the disputed nature of their relationship highlights one of the shortcomings of early developments in pain catastrophising research, namely that it proceeded without a theoretical basis. In the past five years several theories have emerged to try and understand the nature and development of catastrophising in chronic pain.

Communal coping model

Some researchers now conceptualise pain catastrophising as a form of coping. Keefe, Lefebvre, Egert et al. (2000) report that catastrophising mediates the relationship between gender and pain experience and disability in a group of individuals with osteoarthritis of the knees. Women also display more pain behaviours than men in a ten-minute observation period. Sullivan, Tripp & Santor (2000) similarly report that catastrophising mediates the relationship between gender and pain-related outcomes in a cold pressor task with a pain-free student sample. These studies are seen as supporting a communal coping model of catastrophising where it is hypothesised that pain behaviour has the social-communicative function of eliciting support from significant others.

Catastrophising is thought to be part of an interpersonal coping process that is more prevalent in women because of the manner in which females are socialised from a young

age. The social support that is initially elicited by catastrophising individuals may eventually become more important for them than actual pain reduction. As such pain catastrophising in the communal coping model has an adaptive function even though it seems to make the pain problem worse (Keefe et al., 2000; Sullivan et al., 2000).

Lackner & Gurtman (2004) use an interpersonal behaviour model to test the communal coping model of catastrophising in patients with irritable bowel syndrome (IBS).

Catastrophisers have higher levels of interpersonal difficulties and the relationship between catastrophising and interpersonal problems remains significant after the effects of general psychological distress are removed. These results support the interpersonal distinctiveness of those who catastrophise, as advanced by the communal coping model. However this study can be criticised for using trait measures of interpersonal style and for neglecting the changing nature of interpersonal processes as pain becomes a chronic problem (Thorn, Keefe & Anderson, 2004).

Boothby, Thorn, Overduin et al. (2004) overcome this first criticism of the study by Lackner & Gurtman (2004) by specifically examining the relationship between catastrophising and perceptions of the responses of significant others. Surprisingly, catastrophising is not shown to be related to perceived solicitous behaviour from partners of chronic pain patients, which is what might be expected if the function of catastrophising is to elicit social support. Instead, catastrophising is positively correlated with perceived punishing (e.g. angry, frustrated or irritated) responses from partners. Cano (2004) deals with the second criticism of the interpersonal behaviour model study

by examining the role of pain duration in moderating the relationship between catastrophising and perceived support from significant others. The results indicate that pain duration does influence the relationship between these variables. When duration of pain is shorter, catastrophising is related to increased perceptions of solicitous responses but when pain duration is longer catastrophising is associated with less perceived support from spouses.

Recently the communicative nature of catastrophising has been examined from the viewpoint of observers watching videotapes of participants taking part in a cold pressor task (Sullivan, Martel, Tripp et al., 2006). Increased levels of catastrophising in participants are related to observer inferences of more intense pain being experienced. This relationship appears to be mediated by participants' pain behaviours. In an earlier study, the presence of observers during a pain-inducing task is associated with increases in the duration of observable pain behaviours in those who catastrophise highly (Sullivan, Adams & Sullivan, 2004). These studies demonstrate that catastrophising is related to increased pain behaviour and others' perceptions of increased pain in individuals. These findings are consistent with the communal coping model. However these studies have poor ecological validity since they involve healthy volunteers experiencing acute pain in laboratory settings rather than chronic pain sufferers in everyday social environments.

Other studies undermine the validity of the communal coping model. Both Boothby et al. (2004) and Turner et al. (2004) fail to find gender difference in levels of catastrophising, differences that form the basis of model. Severeijns, Vlaeyen & van den

Hout (2004) question whether a communal coping model of catastrophising in chronic pain is necessary at all. In their opinion the model is conceptually unclear and catastrophising should be seen as a cognitive variable rather than in terms of its interpersonal correlates or functions. These are valid criticisms of the model since nearly all the research on pain catastrophising and the communal coping model has been correlational in nature therefore the communicative motivation behind catastrophising has not been clarified. It could well be that catastrophising individuals seek social support *because* they focus on their pain more, rather than pain catastrophising being the result of having an interpersonal approach to managing pain (Severeijns et al., 2004).

This literature provides mixed support for the communal coping model. Nevertheless, one of the strengths of the model is that it highlights the influence of the social context and interpersonal variables in chronic pain processing. These are important factors according to the biopsychosocial approach to chronic pain and have been overlooked in cognitive models of pain experience.

Attentional models

Recent research has examined the relationship between catastrophising and attention. Higher levels of pain catastrophising in healthy volunteers are linked to reduced attention, measured by deterioration in task performance, when participants are distracted by mild electrical stimuli (Vancleef & Peters, 2006). Van Damme, Crombez

& Eccleston (2004a) distinguish between attentional engagement and disengagement when examining the influence of catastrophising. They report that those grouped as high catastrophisers have difficulty disengaging from a painful cue in a cueing task whilst those low in catastrophising do not have this problem. Attentional engagement to pain is not found to be correlated with catastrophising.

In a related study students scoring high in catastrophic thinking have more difficulty disengaging attention when anticipating a painful stimulus than a non-painful stimulus (Van Damme, Crombez & Eccleston, 2004b). The findings have been interpreted to suggest that when somatosensory stimuli are seen as threatening (e.g. painful sensations) attention is kept on these stimuli to facilitate protective strategies. Individuals who catastrophise more about their pain are likely to perceive signals of potential pain as more threatening, so pain responses will be activated faster and their attention will be held to the pain signal more strongly (Van Damme et al., 2004b).

Functional magnetic resonance imaging (fMRI) has recently been used to examine the relationship between catastrophising and attention. Seminowicz & Davis (2006) report a positive association between catastrophising and brain activity in regions related to the motor, affective and attentional aspects of pain in a sample of healthy individuals. Another study demonstrates a similar significant relationship between catastrophising and brain activity in individuals with fibromyalgia when levels of depression are controlled for (Gracely, Geisser, Giesecke et al., 2004). Increased catastrophising is related to increased activity in areas associated with the anticipation of pain (medial

frontal cortex, cerebellum), attention (dorsolateral prefrontal cortex), the emotional aspects of pain (claustrum, closely connected to the amygdala) and motor control. These studies provide more support for a relationship between catastrophising and attention.

Further research is needed to elaborate models of attentional processes in catastrophising about chronic pain. Sullivan et al. (2001) postulate that attention may mediate the relationship between catastrophising and pain experience since increased attentional focus on pain sensations is thought to be one consequence of catastrophising. However it could also be that other appraisals (e.g. negative emotional representations) lead to increased attention to painful stimuli and this heightened attentional focus increases catastrophising. Research that involves the experimental and clinical manipulation of catastrophising and the consequent effects on attention in chronic pain sufferers would help to build theory in this area.

Appraisal models

Aldrich, Eccleston & Crombez (2000) argue that rather than being an unhelpful coping strategy, catastrophising can be thought of more usefully as an expression of worry about pain. Worrying is described as a dynamic cognitive-affective process that involves perseveration of cognition in the form of rumination about potential threats and their possible negative consequences. Chronic worriers are thought to have an attentional bias towards threatening stimuli (Aldrich et al., 2000). Beck (1976) describes catastrophising as a type of distorted cognitive processing that involves focusing on the worst possible

outcome of any situation. Catastrophising is also seen as a negative cognitive process that leads to panic in Clark's cognitive model of panic disorder (Clark & Ehlers, 1993; Clark, 1999). These theories all view catastrophising as a cognitive process involved in the interpretation of threatening stimuli.

Several laboratory studies also suggest that catastrophising about pain is part of an appraisal process. Sullivan, Rodgers & Kirsch (2001) examine the relationship between expectations of pain and emotional distress, catastrophising and depression using a cold pressor task. They report that one factor that partially mediates the relationship between catastrophising and pain experience is individuals' expectations of the degree of pain they are about to experience. In a later study Sullivan, Lynch & Clark (2005) investigate the role of catastrophising on both spontaneous and evoked pain experience and disability in neuropathic pain. Catastrophising is found to be significantly correlated with spontaneous pain measures but not evoked pain measures. One explanation put forward for this pattern of results is that catastrophising processes may only be activated if a certain level of threat or stress is perceived and that the evoked pain stimuli (pinpricks) are not perceived as threatening by the research participants. The results of these studies fit well with an appraisal model in which catastrophising may occur if stimuli are initially appraised as threatening.

The fear-avoidance model of chronic pain also views catastrophising as part of a process of negative appraisal that leads to fear of pain and movement and increasing disability (Vlaeyen et al., 1995). It is thought that illness representations may influence the

development of catastrophising in this model (Vlaeyen & Linton, 2000). Other studies examine the influences of catastrophising and fear of pain on outcome. Buer & Linton (2002) investigate fear-avoidance and catastrophising in spinal pain and suggest that both constructs play an active role in the transition from acute to chronic pain in this population.

Viewing catastrophising as part of an appraisal process may be a useful way of examining the relationship between this construct and acceptance. McCracken & Eccleston (2003) draw attention to a possible link between these two concepts. They postulate that increasing acceptance may be a way of reducing the impact of catastrophic thinking. Viane, Crombez, Eccleston et al. (2003) report that acceptance of pain is significantly related to lower levels of pain catastrophising and predicts mental well-being beyond the effects of catastrophising. More research is needed to investigate the status of catastrophising as a coping, attentional and/or appraisal process and its position in relation to the process of acceptance.

ACCEPTANCE OF CHRONIC PAIN

Origins of the acceptance approach in chronic pain

The notion of acceptance of the self and conscious experience as a key process in personal growth is highlighted and discussed by Rogers (1951) in his person-centred approach to therapy. In recent times acceptance-based approaches have re-emerged in mainstream psychological literature for the treatment of a variety of psychological difficulties (Risdon, Eccleston, Crombez et al., 2003). These approaches include mindfulness-based cognitive therapy for depression (MBCT: Segal, Williams & Teasdale, 2002), dialectical behaviour therapy for borderline personality disorder (DBT: Linehan, 1993) as well as acceptance and commitment therapy (ACT: Hayes, Luoma, Bond et al., 2006) which has been used in chronic pain.

Coping and acceptance-based approaches to chronic pain

The acceptance-based approach questions aspects of the past two decades of research and clinical work that has been aimed at encouraging coping with chronic pain. Many cross-sectional studies have investigated coping and found that individuals vary in the types and the effectiveness of coping strategies they employ (Haythornthwaite, Menefee, Heinberg et al., 1998; Jensen et al., 1991; Keefe, Affleck, Lefebvre et al., 1997). In their review of the psychological aspects of chronic pain, Keefe et al. (2004) evaluate the

research and conclude that coping is reliably related to pain intensity, emotional distress and physical function. Despite this McCracken & Eccleston (2003) argue that the coping framework is an incomplete model with conceptual and empirical limitations. This framework is seen to reduce successful adjustment to chronic pain to the adoption of certain helpful behavioural and/or cognitive strategies and the reduction of unhelpful strategies. It is felt that the resulting research only focuses on cognitive responses and resulting behaviours rather than looking at thoughts, feelings and behaviour within the context of the social environment. The acceptance-based approach tries to broaden the scope of investigation by examining the function of thinking processes and emotions within the social context (McCracken & Eccleston, 2003; McCracken & Eccleston, 2006)

The coping model also views individuals with chronic pain as active agents who can develop strategies to gain control over aversive thoughts, feelings and behaviour. In contrast McCracken (2005) argues that efforts directed towards pain control may only be helpful in the short-term. The pain control approach becomes very unhelpful when it does not succeed but starts to become the focus of the individuals' lives, moving them away from valued activities and interactions with their environment, such as work, family and interests (McCracken, Carson, Eccleston et al., 2004).

In the acceptance model the continued pursuit of pain control despite a lack of success is re-conceptualised as a form of avoidance behaviour that increases the aversiveness of pain-related experiences and reduces functioning (McCracken, 1998). Acceptance of

chronic pain includes approaches such as cognitive defusion and mindfulness which aim to reduce the need to control thoughts and feelings (Hayes, 2004). Cognitive defusion is a technique that tries to alter emotional and behavioural responses to thoughts e.g. by asking the client to repeat unhelpful thoughts out loud until they are perceived as meaningless. The aim of acceptance is to help individuals re-engage in valued activities and to give up unproductive struggles to control or reduce pain. The person acknowledges that pain is present but continues to put their effort into pursuing personal goals and living a satisfying and full life despite this (McCracken, 1998; McCracken, 2005).

Acceptance and coping variables have been compared in their ability to predict pain-related disability, anxiety and depression (McCracken & Eccleston, 2003; McCracken & Eccleston, 2006). The results indicate that acceptance is associated with reduced disability and depression. McCracken & Eccleston (2006) report that acceptance variables account for 46 % more variance across measures of functioning under conditions designed to maximise the variance accountable to coping variables. When these conditions are reversed and acceptance is given priority, it accounts for 625 % more variance in functioning than coping. In both studies, acceptance and coping scores are relatively weakly correlated, indicating that the coping framework does not capture the notion of acceptance. In addition, acceptance of pain is not associated with diverting attention or reinterpreting pain sensations and is negatively associated with praying and hoping. Acceptance is therefore not simply about distracting oneself from pain, thinking

about it in another way or engaging in more positive thinking (McCracken & Eccleston, 2003).

Difficulties defining acceptance in chronic pain

Acceptance of chronic pain is an emerging concept which remains difficult to define. Hayes et al. (2006) view acceptance as a process that involves ‘the active and aware embrace of those private events occasioned by one’s history without unnecessary attempts to change their frequency or form, especially when doing so would cause psychological harm’ (p.7). Acceptance is not seen as an end in itself but as a process which facilitates management of emotions and positive action. Segal et al. (2002) put this in more straightforward terms when they describe acceptance as ‘actively responding to feelings by *allowing* or *letting be* before rushing in and try to fix or change them (the more common response)’ (p.221). Viane, Crombez, Eccleston et al. (2004) demonstrate that acceptance does not predict the use of ignoring pain as a strategy for coping. This is in line with the definition given by Hayes et al. (2006) which describes acceptance as embracing rather than avoiding difficult sensations and experiences.

McCracken et al. (1999) view acceptance of chronic pain as a predominantly behavioural dimension of successful adjustment. Risdon et al. (2003) take a broader perspective by examining acceptance in chronic pain from a social constructionist

perspective. They conduct a Q-methodological analysis on everyday understandings of the concept and derive eight accounts of accepting chronic pain. These are described as taking control; living day-to-day; acknowledging limitations; empowerment; accepting loss of self; more to life than pain; don't fight battles that cannot be won, and spiritual strength. The overarching features of these accounts involve an acknowledgement that finding a cure for pain is unlikely, shifting focus onto non-pain aspects of life and resisting the idea that pain is a sign of weakness of personality. In acknowledging limitations individuals are not thought to be resigning themselves to pain but instead adapting their goals and learning to derive satisfaction from experiences in a life now limited by pain to a certain extent (Risdon et al., 2003).

The definition and operationalisation of acceptance is difficult in part because it can be seen as an outcome as well as a process (Viane et al., 2004). The clarification of relationships between acceptance and other variables in chronic pain is important in order to more fully understand the processes that lead to disability and distress as well as the processes that encourage more positive outcomes.

Studies of acceptance in chronic pain

Henwood & Ellis (2004) demonstrate the relevance of acceptance when they examine individuals' perceptions of living with chronic neuropathic pain (CNP) after spinal cord injury, pain that can seriously affect quality of life and adjustment after injury.

Qualitative analysis of focus group transcripts suggests that medication often fails to help individuals and that learning to live with pain appears to be related to acceptance, which seems help in the adjustment process. In a very different type of study, Gutierrez, Luciano, Rodriguez et al. (2004) compare acceptance and cognitive control-based strategies for coping in experimentally induced pain. In the acceptance-based protocol participants are given tasks to encourage disconnection of pain-related thoughts and feelings from their actions. In the control-based protocol participants are taught strategies to alter and control pain-related thoughts or feelings. The results demonstrate that those who learn acceptance-based strategies are able to tolerate significantly higher levels of pain.

McCracken (1998) reports that increased acceptance of pain is positively correlated with reduced pain intensity, lower pain-related anxiety and less depression and disability. A relatively low correlation between acceptance and pain intensity indicates that acceptance is not simply a function of having less pain. Evidence of the unique effect of acceptance comes from a study by Viane et al. (2003) which demonstrates that increased acceptance in a group of fibromyalgia patients predicts mental well-being beyond the effects of pain catastrophising and severity of pain. Patients with chronic pain who are classified as dysfunctional copers also show significantly less acceptance of chronic pain when the effects of pain severity and depression are controlled for (McCracken et al. 1999). McCracken et al. (2004) have developed the Chronic Pain Acceptance Questionnaire (CPAQ) with two subscales: Activities Engagement and Pain

Willingness. This scale appears to reliably predict pain-related disability and emotional distress.

However these studies of acceptance can be criticised for their reliance on cross-sectional designs at a single time point and on patient self-report. McCracken & Eccleston (2005) attempt to deal with one of these criticisms by carrying out a prospective study on acceptance of chronic pain and patient functioning. Participants are adults referred to a multidisciplinary pain management programme that includes physical rehabilitation and psychological therapies. They are assessed at two time points: at initial assessment and on the first day of treatment, which are on average 3.9 months apart. The results again demonstrate that levels of pain and acceptance are not highly correlated. Levels of pain at Time 2 are also only weakly related to concurrent measures of functioning. In contrast higher levels of acceptance at Time 1 predict higher levels of functioning at Time 2. These results provide longitudinal evidence of the potential usefulness of treatment approaches in chronic pain that try to increase levels of acceptance.

Acceptance-based treatment approaches in chronic pain

Acceptance-based treatment approaches for chronic pain have developed from the Acceptance and Commitment Therapy (ACT) model of psychopathology, one of the third generation of cognitive-behavioural models (Hayes et al., 2006). In this model

psychological difficulties arise when language and cognition interact with contextual features of the environment and result in problems maintaining or changing behaviour so that individuals can pursue goals in line with their personal values. The unhelpful interaction between language, thought processes and the environment is seen as a form of psychological inflexibility. ACT tries to increase psychological flexibility using six core processes or psychological skills: acceptance; defusion of inflexible cognition; being in the present moment; self as context; clarifying values and committed action (Hayes, 2004). Acceptance-based treatment in chronic pain involves all of these processes as well as behaviour change methods such as exposure and experiential techniques to encourage individuals to stop unsuccessful pain control efforts and to weaken the influence of unhelpful thoughts, feelings and sensations. Individuals are encouraged to be willing to experience pain when it serves their long-term goals and values (McCracken, 2005).

Wicksell, Dahl, Magnusson et al. (2005) provide a description of successful acceptance-based treatment in their case study of a 14 year old girl with severely disabling chronic pain of unclear aetiology. Drawing on the ACT model, they postulate that the patient's disability is maintained by avoidance of pain and pain-related stimuli. Treatment focuses on widening the range of behaviours that are directed towards achieving valued goals, as opposed to focusing on levels of pain and distress. After the intervention, there are increases in school attendance and goal-directed activities and reductions in self-reported levels of pain.

While this case study suggests that ACT intervention can be successful, the efficacy and clinical effectiveness of this approach in chronic pain have yet to be established.

Research has now begun in this direction with promising results. Dahl, Wilson & Nilsson (2004) compare a brief ACT intervention and medical treatment with only medical treatment in a preliminary randomised trial of public healthcare workers with chronic stress and pain in Sweden. Their findings indicate that those in the ACT condition function better after treatment, taking fewer days sick leave and utilising less medical treatment at six months follow up. Interestingly, there are no differences between the treatment groups in stress, pain intensity and pain symptoms after intervention. This indicates that the improvements in functioning after the ACT intervention are more likely to be due to increases in acceptance than because of reductions in stress and pain levels. This study suggests that brief ACT interventions can have beneficial long-term effects.

McCracken et al. (2005) investigate acceptance-based treatment in a non-randomised participant sample with more complex and enduring pain problems who have already attended clinical services. Treatment is delivered in a three or four week residential or hospital setting by a multidisciplinary team. Their preliminary analysis indicates improvements in levels of depression, physical disability and hours of daily rest due to pain after treatment and at three months follow-up. Analgesic use, number of GP visits and work status are also assessed and show similar improvements.

These results are particularly interesting given that the individuals treated had already tried various medical and physical interventions without a lot of success. The use of a larger range of outcome measures including more objective measures such as work status and medication prescription as well as self-report questionnaires, means that the results can be interpreted more confidently. During treatment, individuals show large and significant increases in the Activity Engagement and Pain Willingness subscales of the Chronic Pain Acceptance Questionnaire (McCracken et al., 2004). Changes in these scores correlate with changes in most of the other outcome measures. McCracken et al. (2005) suggest that this implies that acceptance is the process underlying improvements. However this suggestion cannot be robustly verified since the study does not examine changes in other underlying psychological processes that may also have occurred during the intervention e.g. changes in catastrophising or in illness representations.

EVALUATION OF THE RESEARCH TO DATE

It is over forty years since Melzack & Wall (1965) introduced the gate control theory and opened the door for research into psychological factors in pain processing. Since then chronic pain research has examined psychological processes such as pain catastrophising and acceptance of chronic pain. These concepts all appear to be implicated in successful emotional and physical functioning. However the majority of research has been correlational in nature and causal relationships have yet to be proven. More longitudinal studies are needed to elucidate causal pathways between psychological

variables and pain experience. Another criticism of research to date is that, while developing understanding of specific psychological variables, there have not been enough attempts to examine relationships between variables and their combined influences on physical and emotional functioning e. g. the relationships between illness representations and the processes of pain catastrophising and acceptance.

CURRENT STUDY

Aims

The purpose of the current study is to examine psychological processes that facilitate living successfully with chronic pain. The specific aim is to investigate relationships between illness representations, catastrophising and acceptance in chronic pain, and how these relationships influence emotional and physical functioning. Investigating interactions between these psychological variables could produce valuable information about the range of beliefs and psychological processes involved in functioning, leading to the development of more a comprehensive theory of psychological adjustment to chronic pain and as well as more powerful clinical interventions.

Theoretical basis of study

It has been consistently demonstrated that reduced pain catastrophising and, more recently, increased acceptance of chronic pain are related to successful physical and emotional functioning. In current research pain catastrophising tends to be conceptualised as either a cognitive or social-communicative process. Acceptance has been conceptualised as one of the six core processes in Acceptance and Commitment Therapy (ACT) and its underlying model of psychopathology (Hayes et al., 2006). McCracken et al. (2005) suggest that acceptance is the underlying mechanism behind improvements in physical and emotional functioning in chronic pain patients after acceptance-based therapy.

In addition, the common-sense theory of illness cognition suggests that illness representations are related to successful functioning in chronic pain. This suggestion is validated by empirical research (e.g. Scharloo et al., 1998; Grouarke et al., 2005) but the relationship between illness representations and functioning is still unclear. Hobro et al. (2004) and Vlaeyen & Linton (2000) suggest that negative illness representations may influence the development of catastrophic thinking. Previous research also demonstrates a relationship between certain illness representations and chronic pain acceptance (Rankin & Holtum, 2003). Based on this previous research, it can be hypothesised that illness representations are related to emotional and physical functioning in chronic pain through the processes of catastrophising and/or acceptance.

Research questions

The study seeks to answer the following questions:

1. What illness representations are associated with pain catastrophising and acceptance of chronic pain?
2. How are illness representations, pain catastrophising and acceptance related to emotional and physical functioning in chronic pain?

Hypotheses

The specific hypotheses are:

1. More negative illness representations (e.g. a high illness identity (viewing more symptoms and labels as being associated with pain), a long timeline which is more cyclical, perceptions of more serious consequences and low levels of control, low illness coherence and high levels of emotional representations) will be correlated with higher levels of pain catastrophising and lower levels of acceptance.
2. Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to emotional functioning through the mediating variables of pain catastrophising or acceptance.

3. Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to physical functioning through the mediating variables of pain catastrophising or acceptance.

Previous research indicates that the dimensions of illness representations most consistently related to adjustment to chronic illness are the consequences, control and illness identity dimensions. Therefore only these illness representations were included in Hypotheses 2 and 3 and in the analyses conducted to test these hypotheses. The emotional representations dimension was also included in Hypotheses 2 and 3 because the influence of this illness representation has yet to be investigated in the research literature even though one would logically expect it to be strongly related to functioning, in particular to emotional functioning.

CHAPTER TWO: METHOD

DESIGN

A cross-sectional questionnaire design was employed.

STATISTICAL POWER

The questionnaire data was examined using path analysis, which involved a set of standard multiple regressions. There was a maximum of 5 predictor variables in the analyses. There are several different methods of determining the number of participants required in multiple regression analyses for the results to achieve statistical power.

Harris (1985) suggests that $n \geq 50 + m$, where m = number of individual predictors.

Using this formula, a minimum of 55 participants would be required for the analyses.

The power primer by Cohen (1992) indicates that a minimum of 91 participants is needed with 5 individual predictors to show a medium effect size. Green (1991)

advocates a more conservative formula of $n \geq 104 + m$ for testing individual predictors assuming a medium effect size. In this case 109 participants would be required. Based on these formulae, it was decided that a minimum of 100 participants was required for my analyses to demonstrate moderate effect sizes at the 0.8 level.

ETHICAL APPROVAL

Ethical approval for the study was granted by Fife and Forth Valley Research and Ethics Committee. The study was also approved by Tayside and Lothian Research and Development Offices and by Pain Association Scotland's research committee. (See Appendix 1 for a copy of the letter confirming ethical approval of the study.)

PARTICIPANTS

240 adults with chronic pain were approached before or after their appointments at Pain Clinics in Tayside and Lothian Primary Care Trusts and at Pain Association Scotland support group meetings. They were given out questionnaire packs that contained information sheets, consent forms, 7 questionnaires and a stamp-addressed envelope. 159 individuals returned questionnaires with signed consent forms (return rate = 66.3 %) and 153 individuals (mean age of 50.8 years, SD = 13.2) with chronic non-malignant pain were included in the study. (See Appendix 2 for a copy of the questionnaire pack.)

102 individuals (66.7 %) were female and 44 individuals (28.8 %) were male, with 7 individuals not stating their gender. Their average duration of pain was 10.0 years (SD = 8.6 years) and their average self-reported pain intensity, measured with the Short-Form McGill Pain Questionnaire (MPQ-SF; Melzack, 1987), was 18.0 out of 50 (SD =

10.1). Therefore participants' average self-reported pain intensity was significant although it varied between individuals. Participants had a variety of sites of pain, with back pain being the most common, as shown in Figure 1. They reported having had a variety of treatments, with prescribed medication, physiotherapy, acupuncture and Tens machines the most common treatments, as shown in Figure 2. This finding reflects the fact that the majority of participants were recruited from Pain Clinics, where these treatments are routinely offered to patients.

Figure 1. Individuals' main sites of pain

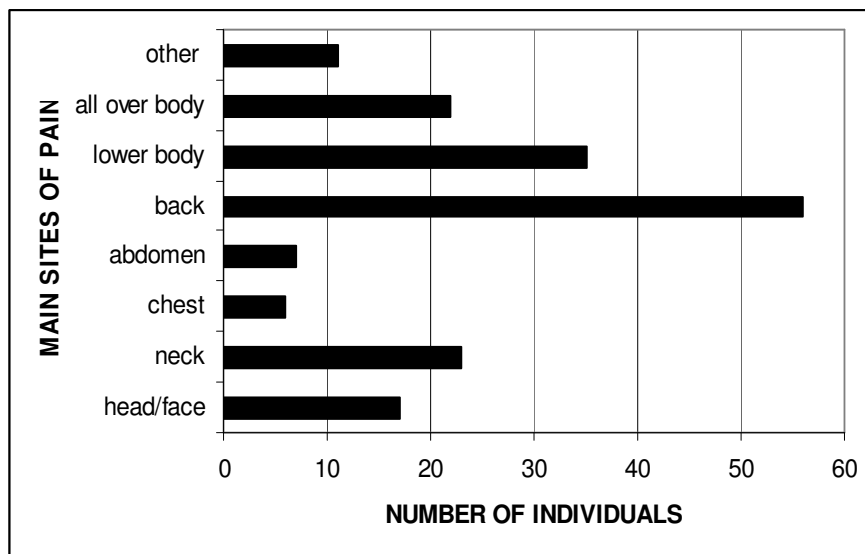
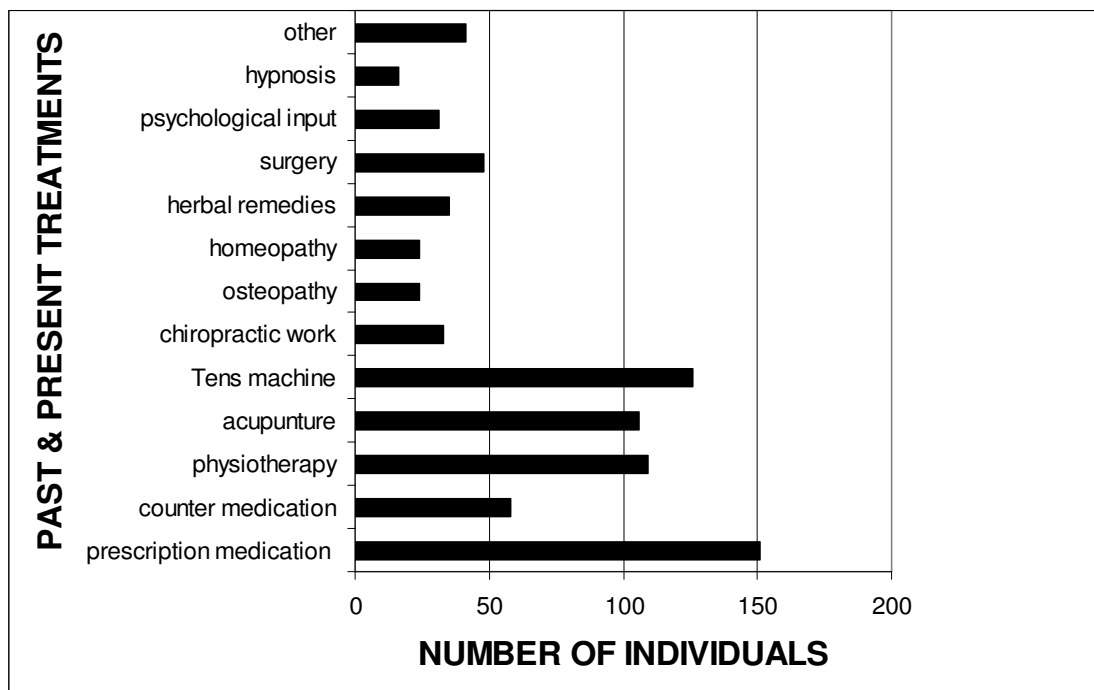


Figure 2. Individuals' past and present pain treatments



INFORMED CONSENT AND PARTICIPANT CONFIDENTIALITY

It was made clear to participants, both verbally and in the information sheets, that participation in the study was entirely voluntary, that they could change their mind about taking part at any point, and that this would not affect their medical care or treatment in any way. It was highlighted to participants that the information sheets contained the contact details of the chief investigator and the research supervisors, should they have any further questions about the study or in the unlikely event that they became distressed during questionnaire completion. Each returned questionnaire was assigned an identification number and no identifying information was included on the computer

database. All consent forms and questionnaires were kept in a secure cabinet in the Clinical Health Psychology Department.

EXCLUSION CRITERIA

Individuals aged less than 18 years or diagnosed with a progressive intellectual impairment (e.g. Alzheimer's type dementia) or a severe and enduring mental illness (e.g. psychotic illness) were excluded from the study because of their reduced capacity for informed consent. Those with a potentially terminal or malignant condition (e.g. cancer, multiple sclerosis) were also excluded. It was felt that these individuals fell into a different chronic pain population with potentially different interactions between psychological factors influencing outcome. On most occasions, clinicians at Pain Clinics were made aware of the study's exclusion criteria and asked to consult their clinic list and provide the appointment times of any patients who fitted this criteria. These patients were not approached to take part. In total, the questionnaires of 7 individuals were excluded from the study: 4 reported on their questionnaires that they had cancer or multiple sclerosis and 3 returned questionnaires mostly uncompleted.

MEASURES

The questionnaire pack included 7 measures:

1. Demographic questionnaire

This non-validated questionnaire was designed by the investigator to elicit demographic information from participants. Questions were included about site(s) of pain, duration and onset of pain and current and past treatments.

2. Chronic Pain Acceptance Questionnaire (CPAQ: McCracken et. al., 2004)

The CPAQ was originally a 34-item measure of acceptance of chronic pain. Based on later analyses the CPAQ was shortened to 20 items with two subscales derived from factor analyses: activities engagement (11 items) and pain willingness (9 items). The CPAQ has been shown to have adequate internal consistency and reliability

($\alpha = 0.78\text{--}0.82$) (McCracken et al., 2004). Data from several studies demonstrate that CPAQ total scores are correlated with standardised measures of emotional distress and daily functioning, supporting its validity as a measure of acceptance (McCracken, 1998; McCracken et al., 1999; McCracken et al., 2004).

3. Pain Catastrophising Scale (PCS: Sullivan et al., 1995)

The PCS is a 13-item scale with three subscales: rumination, magnification and helplessness. It has been demonstrated to have high internal consistency ($\alpha = 0.87$), good reliability and validity in clinical and experimental samples as well as conceptual distinctiveness from related cognitive-affective constructs e.g. clinical depression (Sullivan et al., 1995). The PCS has been widely used to examine the role of catastrophising in the chronic pain population (e. g. Severeijns et al., 2001; Sullivan et al., 2001; Turner et al., 2004).

4. Illness Perceptions Questionnaire –Revised (IPQ-R: Moss-Morris et al., 2002)

The IPQ-R measures the different dimensions of illness representations that are derived from Leventhal's self-regulatory model: illness identity, cause, timeline, consequences, control, illness coherence, cyclical nature and emotional representations (Leventhal et al., 1992; Leventhal et al., 1997). Items are scored on a five-point scale ranging from 'strongly agree' to 'strongly disagree'. The IPQ-R has been widely used in chronic illness populations including chronic pain. Validity and reliability have been established for the measure in several chronic conditions (Moss-Morris et al., 2002).

5. McGill Pain Questionnaire – Short Form (MPQ-SF: Melzack, 1987)

The MPQ-SF consists of 15 descriptors rated on an intensity scale from 0 = none to 3 = severe. It also includes the Present Pain Intensity (PPI) scale which is rated using one of five pain descriptors (mild, discomforting, distressing, horrible and excruciating). The MPQ-SF is widely used with chronic pain populations and has established validity and reliability (Melzack, 1987; Melzack & Katz, 1992).

6. Roland-Morris Disability Scale (RDQ: Roland & Morris, 1983)

The RDQ is a 24-item questionnaire designed to assess level of physical functioning. It was initially developed for those with chronic lower-back pain and has good reliability and validity for this population (Roland & Fairbank, 2000). Jensen, Strom, Turner et al. (1992) conclude that the reliability and validity of the scale is also acceptable in a heterogeneous group of chronic pain patients, and its short length makes very useful for research purposes when combined with other measures.

Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983)

The HADS is widely used for measuring anxiety and depression in clinical populations with physical illness. It contains 14 items and gives an overall measure of emotional distress as well as depression and anxiety subscale scores. It has achieved good internal consistency ($\alpha = 0.90 - 0.93$), validity and test-retest reliability (Moorey, Greer, Watson et al., 1991; Snaith & Zigmond, 1994).

CHAPTER THREE: RESULTS

STATISTICAL ANALYSES

The data was collected and analysed using the Statistical Package for the Social Sciences (SPSS) Version 14.0 for Windows. Bivariate correlations were carried out to examine the relationships between illness representations, catastrophising and acceptance, in order to test Hypothesis 1. Path analyses were then conducted by carrying out several standard multiple regressions, to determine whether illness identity, consequences, control and emotional representations were indirectly related to emotional functioning through the mediating variables of catastrophising or acceptance (Hypothesis 2). Similarly, path analyses were conducted to determine whether these illness representations were indirectly related to physical functioning through the mediating variables of catastrophising or acceptance (Hypothesis 3).

PRELIMINARY ANALYSES

Preliminary analyses, including examination of the residuals and collinearity statistics from the multiple regressions, were also carried out. This was done to check for outliers and to ascertain that the assumptions for multiple regression analyses (normality, linearity, lack of multicollinearity) were met. In all cases, residual plots were normally distributed and there was no evidence that residuals were anything but randomly distributed relative to the predicted values of the dependent variables. All the other assumptions were met apart from the fact that the Pain Catastrophising Scale (PCS) and

physical functioning variable (Roland Disability Questionnaire: RDQ) demonstrated significant negative kurtosis. Standard transformations (square root, inverse and log transformations) were conducted on these variables but did not remove kurtosis while retaining nonsignificant skewness. It was decided to carry out regression analyses using the untransformed data since negative kurtosis does not affect the results of analyses when sample sizes are large (over 100 or more cases) as was the case in the present study (Tabachnick & Fidell, 1996).

DESCRIPTIVE DATA

Table 1 shows the means and standard deviations for the illness representation (IPQ-R) variables, catastrophising (PCS), acceptance (CPAQ), emotional functioning (HADS) and physical functioning (RDQ).

Table 1. Means and standard deviations (SD) for illness representation (IPQ-R) variables, catastrophising (PCS), acceptance (CPAQ), emotional functioning (HADS) and physical functioning (RDQ)

Variable	Mean	SD	Variable	Mean	SD
1. Acceptance (CPAQ)	55.3	20.9	7. Cyclical nature (IPQ-R)	12.7	4.0
2. Catastrophising (PCS)	21.8	13.6	8. Illness coherence (IPQ-R)	15.7	5.6
3. Illness identity (IPQ-R)	4.80	3.0	9. Emotional representations (IPQ-R)	19.2	5.5
4. Consequences (IPQ-R)	20.7	5.2	10. Emotional functioning (HADS)	17.1	8.5
5. Timeline (IPQ-R)	23.3	4.9	11. Physical functioning (RDQ)	11.9	6.0
6. Control (IPQ-R)	34.0	7.1			

BIVARIATE CORRELATIONS

Table 2 shows the Pearson correlation coefficients among illness representations variables, catastrophising and acceptance. The large number of bivariate correlations carried out meant that there was an increased risk of a Type 1 error (when a statistical result is viewed as significant but it has in fact arisen by chance). In order to reduce this risk, only correlations with a significance value below the 1 % level in Table 2 were viewed as significant.

Table 2. Pearson correlation coefficients (r) among illness representation (IPQ-R) variables, catastrophising (PCS) and acceptance (CPAQ)

Variables	2.	3.	4.	5.	6.	7.	8.	9.
1. Acceptance (CPAQ)	-0.68**	-0.37**	-0.66**	-0.35**	0.32**	-0.03	0.18*	-0.59**
2. Catastrophising (PCS)	-	0.35**	0.59**	0.36**	-0.37**	0.08	-0.32**	0.74**
3. Illness identity (IPQ-R)	-	-	0.33**	0.19*	0.02	0.19*	0.08	0.28**
4. Consequences (IPQ-R)	-	-	-	0.53**	-0.23**	-0.03	-0.10	0.53**
5. Timeline (IPQ-R)	-	-	-	-	-0.37**	-0.19*	-0.05	0.40**
6. Control (IPQ-R)	-	-	-	-	-	0.20*	0.33**	-0.30**
7. Cyclical nature (IPQ-R)	-	-	-	-	-	-	-0.01	0.11
8. Illness coherence (IPQ-R)	-	-	-	-	-	-	-	-0.41**
9. Emotional representations (IPQ-R)	-	-	-	-	-	-	-	-

** p<0.01 * p<0.05

Hypothesis 1

“More negative illness representations (e.g. a high illness identity, a long timeline which is more cyclical, perceptions of more serious consequences and low levels of control, low illness coherence and high levels of emotional representations) will be correlated with higher levels of pain catastrophising and lower levels of acceptance.”

In Table 2 there were significant positive correlations between catastrophising and illness identity, consequences, timeline and emotional representations. There were significant negative correlations between catastrophising and acceptance, control and illness coherence. Catastrophising correlated most highly with acceptance ($r = -0.68$, $p < 0.01$), consequences ($r = 0.59$, $p < 0.01$) and emotional representations ($r = 0.74$, $p < 0.01$).

There were also a significant positive correlation between acceptance and control but the correlation between acceptance and illness coherence was low ($r = 0.18$, $p < 0.05$). Acceptance was significantly negatively correlated with illness identity, consequences, timeline and emotional representations. The highest correlations were between acceptance and consequences ($r = -0.66$, $p < 0.01$) and acceptance and emotional representations ($r = -0.59$, $p < 0.01$).

In summary, a high illness identity (more symptoms and labels associated with the pain), perceptions of more serious consequences, a longer timeline and higher emotional representations were significantly associated with increased pain catastrophising and reduced acceptance. Low levels of perceived control and low illness coherence were significantly associated with increased catastrophising and low perceived control was also significantly related to reduced acceptance. These findings meant that Hypothesis 1 was supported. Having a more fluctuating condition (IPQ-R cyclical subscale) was not associated with catastrophising or acceptance and low illness coherence was only associated with reduced acceptance at the 5 % significance level.

PATH ANALYSES

Path analyses were used to test Hypotheses 2 and 3.

Path models

The two resulting path models are presented in Figures 3 and 4 and were created by carrying out standard multiple regressions at each path node (each variable with inputs in the form of arrows) (Bramwell, 1996; Frazier, Tix & Barron, 2004). The path coefficients in the models were the standardised regression coefficients (beta values) from the multiple regressions carried out at that node. For example in Figure 3 the path coefficient between the illness identity and catastrophising variables is 0.09. This derives from the illness identity beta value of 0.09 when illness identity, consequences, control,

emotional representations and acceptance were entered as the independent variables in a standard multiple regression with catastrophising as the dependent variable. A t-test based on the unstandardised regression coefficient was used to test the statistical significance of each path coefficient. Statistical significance is indicated in Figures 3 and 4 using asterisks. Error terms (e) are also presented in Figures 3 and 4. Error terms were calculated by taking the square root of $1 - R^2$. They represent the percentage of variance remaining unexplained at each path node after the relevant multiple regression was conducted (Bramwell, 1996).

Figure 3. Path model for illness representation (IPQ-R) variables illness identity, consequences, control and emotional representations, catastrophising (PCS), acceptance (CPAQ) and emotional functioning (HADS)

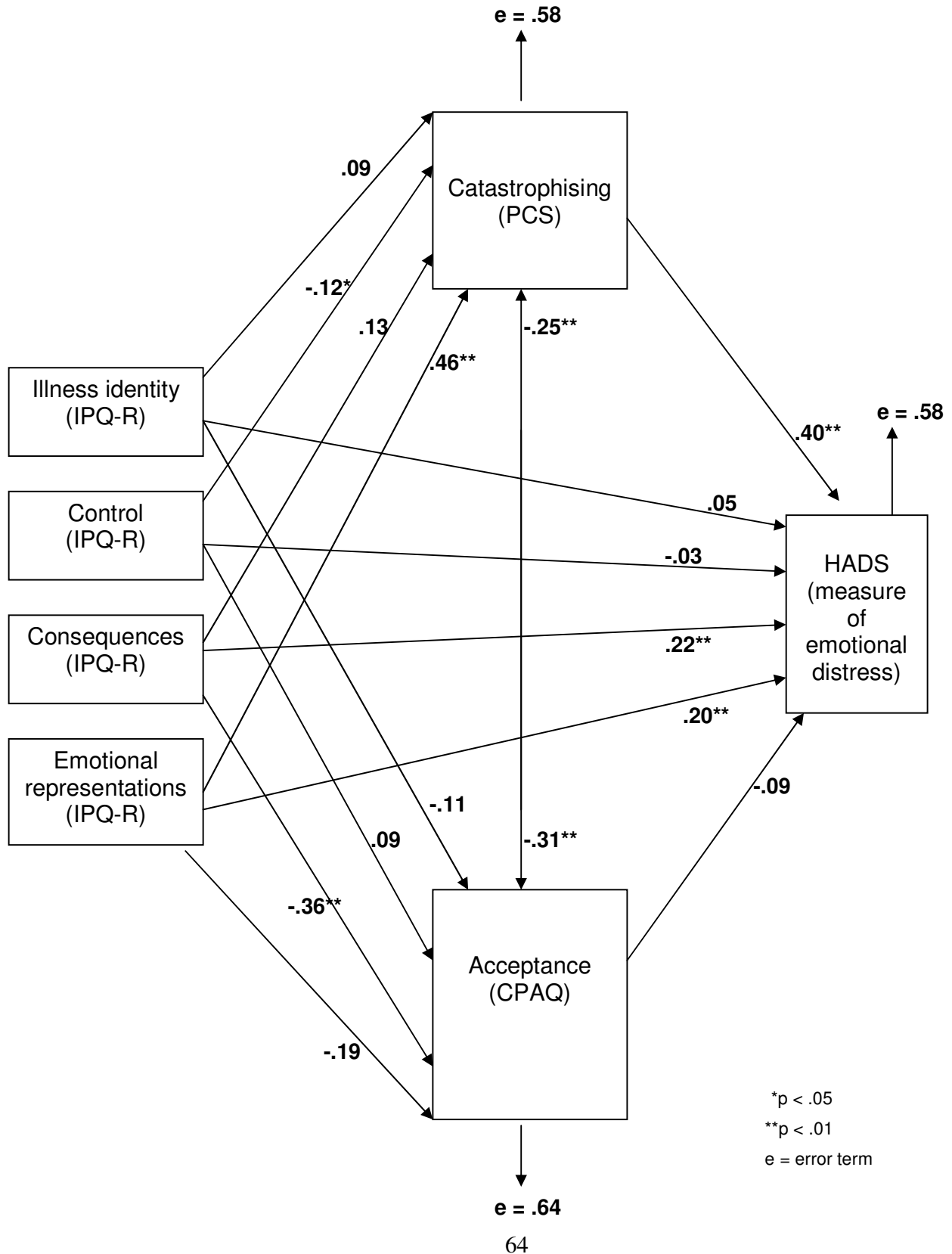
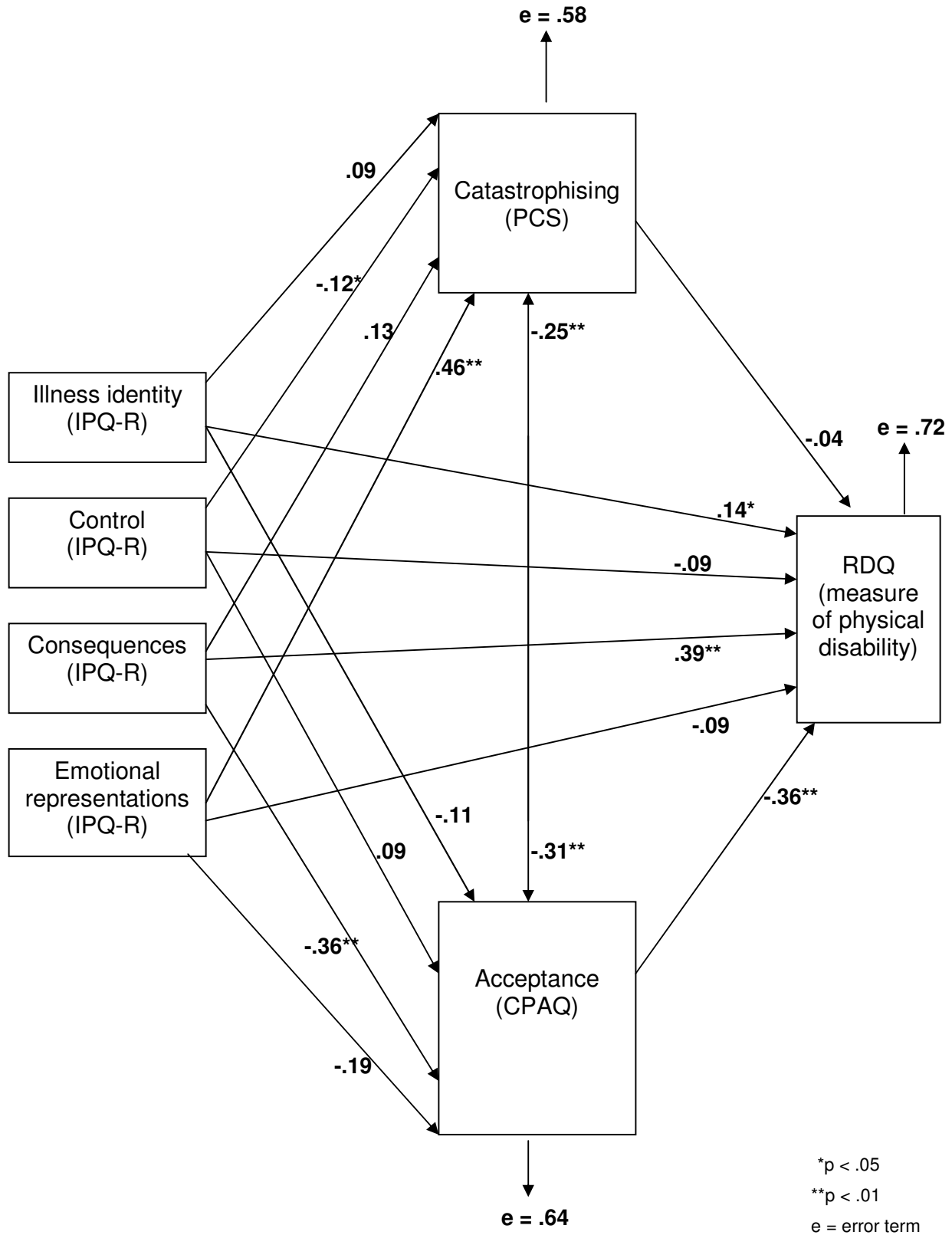


Figure 4. Path model for illness representation (IPQ-R) variables illness identity, consequences, control and emotional representations, catastrophising (PCS), acceptance (CPAQ) and physical functioning (RDQ)



Success of path models

In Figure 3 the error terms associated with the catastrophising node ($e = 0.58$), the acceptance node ($e = 0.64$) and the emotional functioning node ($e = 0.58$) were moderate. This indicated that the path model in Figure 3 was relatively successful since a large proportion of the variance in these variables was explained by the regression analyses carried out. In Figure 4 the error terms associated with the catastrophising node ($e = 0.58$) and acceptance node ($e = 0.64$) nodes were the same as in Figure 3 but the error term associated with the physical functioning node (RDQ) seemed quite high ($e = 0.72$). However using the estimations of Cohen (1992) the error term ($\sqrt{1-R^2}$) that is associated with a correlation of $r = 0.5$ (equivalent to a large effect size) is 0.75 (Cohen, 1992). Therefore the error term associated with the RDQ node in Figure 4, though appearing quite high, still approximated to a large effect size. This indicated that the path model in Figure 4 was also relatively successful.

Hypothesis 2

“Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to emotional functioning through the mediating variables of pain catastrophising or acceptance.”

If Hypothesis 2 was supported, and catastrophising or acceptance mediated the relationship between the illness representation variables and emotional functioning, then the path coefficients between illness representation variables and catastrophising, and between catastrophising and emotional functioning would be significant. Alternatively, the path coefficients between illness representation variables and acceptance, and between acceptance and emotional functioning would be significant.

In Figure 3 increased catastrophising was significantly related to increased HADS scores, and thereby reduced emotional functioning (path value = 0.40, $p < 0.01$).

Perceptions of reduced control (path value = -0.12, $p < 0.05$), increased emotional representations (path value = 0.46, $p < 0.01$) as well as reduced acceptance (path value = -0.25, $p < 0.01$) were also significantly related to increased catastrophising. These findings suggested that the acceptance, control and emotional representation variables were indirectly related to emotional functioning through the mediating variable of catastrophising. The relationship between acceptance and HADS scores was not

significant (path value = -0.09, $p > 0.05$). Therefore acceptance could not mediate the relationships between illness representations and emotional functioning. In Figure 3 perceptions of more serious consequences (path value = 0.22, $p < 0.01$) were also significantly directly related to increased HADS scores, and thereby reduced emotional functioning.

Emotional representations were also significantly directly related to emotional functioning (path value = 0.20, $p < 0.01$). Therefore it may have been the case that the indirect relationship between emotional representations and emotional functioning via catastrophising was artificially created by the direct relationships between emotional representations and emotional functioning and between catastrophising and emotional functioning in Figure 3. Another standard multiple regression was carried out in order to test this. The catastrophising variable was regressed onto all the illness representation variables, acceptance and emotional functioning (HADS scores). The standardised regression coefficient for the emotional representations variable in this regression analysis was significant ($\beta = 0.33$, $t = 4.93$, $p < 0.01$). This result indicated that emotional representations had a significant relationship with catastrophising that was separate from the effect of emotional functioning on catastrophising. This finding suggested that there was an indirect path between emotional representations and emotional functioning via catastrophising, the effect of which was separate from the effects of the other direct paths in the model.

The strengths of the indirect pathways between the control, emotional representations and acceptance variables and emotional functioning via catastrophising were calculated by multiplying the path coefficients between them (Bramwell, 1996). The indirect effect of control on emotional functioning via an effect on catastrophising was weak ($-0.12 \times 0.40 = -0.05$) and the indirect effects of emotional representations ($0.46 \times 0.40 = 0.18$) and acceptance ($-0.25 \times 0.40 = -0.10$) on emotional functioning were only slightly higher.

In summary, Hypothesis 2 stated that illness representations were indirectly related to emotional functioning through the mediating variables of catastrophising or acceptance. The results demonstrated that perceptions of control and emotional representations were indirectly related to emotional functioning through the mediating variable of catastrophising. Acceptance did not have a significant direct effect on emotional functioning therefore did not mediate the relationship between illness representation variables and emotional functioning. Instead the relationship between acceptance and emotional functioning was mediated by catastrophising as well. There were also significant direct relationships between perceptions of more serious consequences and reduced emotional functioning and between increased emotional representations and reduced emotional functioning. These findings provided some support for Hypothesis 2 by suggesting that the influence of illness representations on emotional functioning in chronic pain is partially mediated by the process of catastrophising.

Hypothesis 3

“Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to physical functioning through the mediating variables of pain catastrophising or acceptance.”

Figure 4 shows the path analysis carried out in order to examine the relationships between illness representation variables, catastrophising, acceptance and physical functioning. If Hypothesis 3 was supported, and illness representations were indirectly related to physical functioning via effects on catastrophising or acceptance, then the path coefficients between illness representations and catastrophising and between catastrophising and physical functioning would be significant. Alternatively, the relationships between illness representations and acceptance and between acceptance and physical functioning would be significant.

In Figure 4 increased acceptance was significantly related to reduced RDQ scores, and thereby increased physical functioning (path value = -0.36, $p < 0.01$). In Figure 4 perceptions of less serious consequences (path value = -0.36, $p < 0.01$) as well as reduced catastrophising (path value = -0.31, $p < 0.01$) were also significantly related to increased acceptance. These findings suggested that perceptions of consequences were indirectly related to physical functioning through the mediating variable of acceptance. The relationship between catastrophising and physical functioning was not significant (path

value = -0.04, $p > 0.05$). Therefore catastrophising could not mediate the relationships between illness representations and physical functioning. Instead, the effect of catastrophising on physical functioning was also mediated by acceptance.

In Figure 4 perceptions of more serious consequences (path coefficient value = 0.39, $p < 0.01$) and increased illness identity (path value = 0.14, $p < 0.05$) were both significantly directly related to increased RDQ scores, and thereby reduced physical functioning. These findings meant that the indirect relationship between consequences and physical functioning (via acceptance) may have been artificially created by the significant direct relationships between consequences and physical functioning and between physical functioning and acceptance. In order to test whether this was the case, the acceptance variable was regressed onto all the illness representation variables, catastrophising and RDQ scores. The standardised regression coefficient for the variable consequences in this regression analysis was significant ($\beta = -0.22$, $t = -2.89$, $p < 0.01$).

This result indicated that the variable consequences had a significant effect on acceptance that was separate from the effect of physical functioning on acceptance. This finding suggested that there was an indirect path between consequences and physical functioning via acceptance, the effect of which was separate from the effects of other direct paths in the model. The strengths of the indirect pathways between the consequences variable and physical functioning via acceptance and between catastrophising and physical functioning via acceptance were again calculated. The

indirect effects of consequences (0.13) and catastrophising (0.11) on physical functioning via acceptance were both quite weak.

In summary, Hypothesis 3 stated that illness representations (i.e. illness identity, consequences, control and emotional representations) would be indirectly related to physical functioning through the mediating variables of catastrophising or acceptance. The results demonstrated catastrophising did not mediate relationships between illness representations and physical functioning. Instead the relationship between catastrophising and physical functioning was mediated by acceptance. There were significant relationships between perceptions of more serious consequences and reduced physical functioning and between increased illness identity and reduced physical functioning. The relationship between representations of illness consequences and physical functioning was also partially mediated by acceptance. Taken together these results provide some support for Hypothesis 3.

CHAPTER FOUR: DISCUSSION

SUMMARY OF RESEARCH AIMS

The purpose of the current study is to investigate psychological processes that facilitate successfully living with chronic pain. Research has so far identified several psychological variables of importance including pain catastrophising and acceptance. However there have been few attempts to integrate research findings and investigate the interactions between these concepts in order to develop more comprehensive models of successful adjustment. The present study explores models of emotional and physical functioning which involve interactions between illness representations and the processes of pain catastrophising and acceptance. The study asks the following research questions:

1. What illness representations are associated with pain catastrophising and acceptance of chronic pain?
2. How are illness representations, pain catastrophising and acceptance related to emotional and physical functioning in chronic pain?

Based on previous theory and research, it was hypothesised that the relationships between illness representations and emotional and physical functioning were mediated by the processes of catastrophising or acceptance. The research questions and hypotheses were examined using questionnaire data from patients attending NHS Pain Clinics as well as individuals attending pain support group meetings in the community.

HYPOTHESIS 1

“More negative illness representations (e.g. a high illness identity (viewing more symptoms and labels as being associated with pain), a long timeline which is more cyclical, perceptions of more serious consequences and low levels of control, low illness coherence (poor overall understanding of pain condition) and high levels of emotional representations) will be correlated with higher levels of pain catastrophising and lower levels of acceptance.”

Summary of results

Bivariate correlational analyses were carried out to examine the relationships between illness representation variables, catastrophising and acceptance. Catastrophising and acceptance were significantly negatively correlated. There were also significant correlations in the expected directions between catastrophising and all the illness representation variables apart from the cyclical variable. Similarly, there were significant correlations in the expected directions between acceptance and all the illness representation variables apart from the cyclical variable. As a result Hypothesis 1 was supported. Therefore viewing more symptoms and labels as being associated with pain, believing that the pain will last for a long time and have more serious consequences and that one does not have a lot of control over this, a lack of coherent understanding of the

pain condition and having more negative emotional reactions are correlated with higher levels of pain catastrophising and lower levels of acceptance. Viewing the pain condition as fluctuating over time (cyclical dimension) is not related to catastrophising or acceptance.

Comparison with previous research

Catastrophising (focusing on and exaggerating the possibility of negative outcomes) is negatively related to acceptance of chronic pain ($r = -0.68$, $p < 0.01$). This result is in line with the findings of Viane et al. (2003) who also report a highly significant negative correlation between these two variables. However the current findings contradict those of a previous study that examines the relationships between illness representations and acceptance in chronic pain. Rankin & Holtum (2003) report that in patients with chronic lower-back pain the only illness representations significantly associated with increased acceptance are perceptions of less serious consequences and reduced illness identity. In the present study perceptions of timeline, illness coherence, control and emotional representations are also significantly related to acceptance. One possible explanation for this different pattern of results is that Rankin & Holtum (2003) use another measure of acceptance, the Acceptance of Illness Scale (Felton & Revenson, 1984), and not the Chronic Pain Acceptance Questionnaire (CPAQ: McCracken et al., 2004) used in the present study.

Another possible reason for the discrepancy between studies is the use of different participant samples. Rankin & Holttun (2003) recruit patients with chronic lower-back pain whereas the present study utilises data from both Pain Clinic patients and non-patients with a range of pain locations and conditions. In the light of these differences one could speculate that the relationship between illness representations and psychological processes such as acceptance might well depend on the assessment measures used and the type of pain condition or location of pain.

The results of the bivariate correlations add weight to the assertions of Hobro et al. (2004) that pain catastrophising may comprise of a particular combination of illness representations and similarly the view of Vlaeyen & Linton (2000) that threatening illness information may be a precursor of catastrophising in the fear-avoidance model of chronic pain. Hobro et al. (2004) mention illness identity, control and consequences as the illness representation dimensions that might influence catastrophising. The results of present correlational analysis suggest that a wider range of illness representation variables are implicated in catastrophising, including representations of timeline, illness coherence and emotions as well as the control, consequences and illness identity dimensions.

In previous research on illness representations and adjustment to chronic illnesses (e.g. Kemp et al., 1999; Grouarke et al., 2005) perceptions of more serious consequences are consistently related to poorer physical functioning and emotional distress. The current results extend these findings by demonstrating that perceptions of consequences are also

highly correlated with catastrophising and acceptance. The influence of emotional representations on adjustment to chronic illness has rarely been studied and this variable was only added to the revised version of the Illness Perceptions Questionnaire (IPQ-R: Moss-Morris et al., 2002). The inclusion of the emotional representations variable in the present study adds to previous research into illness representations and demonstrates that emotional responses to chronic pain are also significantly related to the processes of catastrophising and acceptance.

The results also indicate that perceptions of control are moderately positively correlated with acceptance ($r = 0.32$). This supports previous research that has already demonstrated a relationship between beliefs about control over pain and adjustment to chronic pain (Turner et al., 2000). However the relationship between acceptance and control is somewhat paradoxical. McCracken & Eccleston (2003) criticise two decades of research on coping with pain for focusing too narrowly on behaviours that aim to control the sensations and feelings associated with pain. They suggest that chronic pain problems can be exacerbated in the long-term by excessive attempts to control or reduce pain, and that pain control in this context can be seen as a form of behavioural and emotional avoidance. The positive correlation between acceptance and perceptions of personal control in the present study is surprising, given that acceptance-based approach to chronic pain questions the utility of a pain control agenda.

HYPOTHESIS TWO

“Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to emotional functioning through the mediating variables of pain catastrophising or acceptance.”

Summary of results

Path analysis was conducted in order to test Hypothesis 2. Standard multiple regression analyses were carried out to create the path model presented in Figure 3.

Representations of control and emotional representations were significantly related to catastrophising and catastrophising was significantly related to emotional functioning, as measured by the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983). These findings demonstrated that representations of control and emotional representations were indirectly related to emotional functioning via catastrophising. The path coefficient between acceptance and emotional functioning was not significant, indicating that acceptance could not mediate the relationships between illness representations and emotional functioning. The relationship between acceptance and emotional functioning was also mediated by catastrophising. The path model in Figure 3 indicated that the representations of illness consequences and emotional representations

were also significant directly related to emotional functioning. These findings provided partial support for Hypothesis 2.

Therefore perceptions of increased control, having less negative emotional responses and increased acceptance of chronic pain are indirectly related to emotional functioning through the mediating variable of pain catastrophising. In addition, believing that the pain will have more serious consequences and having more negative emotional responses to pain are independently related to reduced emotional functioning.

Comparison with previous research

The finding that the relationship between acceptance and emotional functioning is mediated by catastrophising is very surprising. It contradicts the findings of Viane et al. (2003) where acceptance of pain in a group of fibromyalgia sufferers is shown to predict mental well-being beyond the effects of catastrophising and pain severity. Other studies (McCracken et al., 2004; McCracken, 1998) also imply the existence of a direct relationship between acceptance and emotional distress. McCracken et al. (2005) report reductions in levels of depression after acceptance-based treatment in patients with longstanding chronic pain and suggest that increasing acceptance is the mechanism through which functioning improves. The results of the current study suggest that, at least in those who have not received acceptance-based treatment for chronic pain, the process of catastrophising, and also perceptions of illness consequences and negative

emotional representations, more powerfully influence emotional functioning than acceptance.

These findings add to the literature on the relationship between catastrophising and emotional functioning. Turner et al. (2000) indicate that pain belief scores and catastrophising independently predict depression after controlling for variables including age, sex and pain intensity. Several other studies also demonstrate a relationship between catastrophising and emotional distress beyond the effects of other variables (e.g. Severeijns et al., 2001; Sullivan et al., 1995). The present study suggests that catastrophising mediates the influence of other psychological variables on emotional functioning in chronic pain. Interestingly, the study by Turner et al. (2000) suggests that catastrophising independently predicts depression but not physical disability. In the current study the path models presented in Figures 3 and 4 demonstrate a similar pattern of results, in that catastrophising is directly related to emotional functioning but only indirectly related to physical functioning. The latter finding will be discussed later in this discussion section.

The relationships between illness representations and emotional functioning in the current study add to current understanding of the influence of illness representations. In a range of studies, perceptions of more serious consequences are consistently correlated to emotional distress and depression in various chronic illnesses (e. g. Kemp et al., 1999; Goldstein et al., 2005). The current findings indicate that representations of consequences also influence emotional functioning in a way that is not mediated by the

processes of pain catastrophising or acceptance. Representations of emotions are also directly related to emotional functioning. The impact of emotional representations, which derive from the common-sense model of illness cognition (Leventhal et al., 1992), does not appear to have been examined until now, although one would logically expect a relationship to exist between emotional responses to pain and general emotional functioning. The current results suggest that the only other illness representation related to emotional functioning is perceived control (perceptions of personal empowerment in relation to pain), and that the influence of this representation is mediated by catastrophising. These results are surprising, given that in previous studies (e.g. Kemp et al., 1999; Goldstein et al., 2005; Grouarke et al., 2005) high levels of illness identity are consistently related to reduced emotional functioning.

HYPOTHESIS 3

“Illness representations (e.g. illness identity, consequences, control and emotional representations) are indirectly related to physical functioning through the mediating variables of pain catastrophising or acceptance.”

Summary of results

Path analysis was also used to test Hypothesis 3. The path model in Figure 4 indicated that the relationship between perceptions of illness consequences and physical functioning was mediated by acceptance. Catastrophising did not mediate the relationships between illness representations and physical functioning. Instead the

relationship between catastrophising and physical functioning was also mediated by acceptance. Perceptions of illness consequences and illness identity were also significantly directly related to physical functioning. These findings provided partial support for Hypothesis 3.

Therefore perceptions of more serious consequences and catastrophising about pain are indirectly related to physical functioning through the mediating process of acceptance. The symptoms and labels associated with the pain condition (illness identity) and perceptions of consequences are also directly related to physical functioning.

Comparison with previous research

The current finding that acceptance is the mediating process involved in successful physical functioning supports the results of controlled acceptance-based intervention studies. Dahl et al. (2004) report that Acceptance and Commitment Therapy (ACT) for healthcare workers with chronic pain leads to increased physical functioning while McCracken et al. (2005) demonstrate that ACT intervention for patients with complex pain conditions increases physical ability, measured by both self-report and work status. McCracken and colleagues also repeatedly report that acceptance, as measured by the Chronic Pain Acceptance Questionnaire (CPAQ), predicts physical disability (McCracken, 1998; McCracken & Eccleston, 2003; McCracken et al., 2005; McCracken & Eccleston, 2006).

The finding that catastrophising is related to physical functioning through the process of acceptance is surprising since past research suggests a direct effect of catastrophising on physical disability. Severeijns et al. (2001) report that catastrophising significantly contributes to pain-related disability and remains a significant predictor of outcome when controlling for physical impairment and also across different subgroups of patients. In the communal coping model, catastrophising is thought to occur because individuals have an interpersonal style of coping and catastrophise in order to gain social support (Sullivan et al., 2001). The model infers direct relationships between catastrophising and self-reported physical ability since the underlying purpose of catastrophising is to let others know that one is struggling with pain and needs help. However the current results suggest that even if someone catastrophises, their level of acceptance will have more influence on their physical ability.

Interestingly, the path analysis in Figure 4 suggests that both representations of illness identity and consequences have direct effects on physical disability beyond any effects through catastrophising or acceptance. These results in some respects mirror the findings of other studies by suggesting that these dimensions of illness representations directly influence physical ability. Scharloo et al. (1998) analyse the influence of illness representations on physical functioning in a variety of conditions including rheumatoid arthritis. They report that a stronger illness identity and perceptions that the condition has more serious consequences are related to poor physical function beyond the effects of coping. When examining the influence of illness representations in rheumatoid

arthritis, Grouarke et al. (2005) similarly report that increased illness identity and consequences, as well as reduced control, predict physical disability beyond the effects of disease status.

THEORETICAL IMPLICATIONS OF RESULTS

The study results have several theoretical implications. The processes of catastrophising and acceptance partially mediate the relationships between illness representations and functioning but a different pattern of relationships exists between illness representations and psychological processes depending on whether physical or emotional functioning is being examined.

A cognitive model of emotional functioning in individuals with chronic pain?

In the case of emotional functioning, catastrophising mediates the effects of perceptions of control and partially mediates emotional responses to pain. The relationship between acceptance and emotional functioning is also mediated by catastrophising. The process of catastrophising about chronic pain involves focussing on pain, magnifying the negative possibilities of having pain and feeling helpless (Sullivan et al., 1995). One way of thinking about catastrophising is that it is a form of distorted cognitive processing that can be linked to processes such as the negative cognitive bias in the cognitive model of depression proposed by Beck (1987) or the catastrophic

misinterpretation of bodily sensations that leads to panic in the cognitive model of panic disorder (Clark & Ehlers, 1993; Clark, 1999). The results of the present study suggest that this negative thinking process may be an underlying mechanism behind poor emotional functioning. These findings provide support for a cognitive primacy model of emotional functioning in chronic pain.

Appraisals of the consequences of pain and representations of emotions are also directly related to emotional functioning. Moss-Morris et al. (2002) provide evidence that the emotional representations subscale of the IPQ-R is not simply a measure of negative affect but a measure of individuals' emotional reactions to having chronic pain (sample IPQ-R items include 'My pain makes me feel angry.' and 'My illness does not worry me.'). In the path model in Figure 3, the relationship between emotional representations and emotional functioning is also partially mediated by catastrophising. The relationship between emotional representations and catastrophising is stronger than the direct relationship between emotional representations and emotional functioning. These results suggest that the process of catastrophising may act as an amplifier for negative emotional reactions to chronic pain. The concept of emotional representations derives from the common-sense model of illness cognition in which representations of illness are generated in order to deal with health threats (Leventhal et al., 1992). In the context of chronic pain, if negative emotional reactions are generated, this may lead to a certain amount of emotional distress. However if distorted cognitive processing in the form of

catastrophising about pain also occurs then emotional distress is likely to be significantly worse.

The finding that the relationship between acceptance and emotional functioning is mediated by catastrophising may also reflect that fact that participants in this study have not undergone ACT intervention for their chronic pain. A recent study suggests that increasing acceptance may be the operating mechanism behind increased emotional functioning during acceptance-based therapy for chronic pain (McCracken et al. 2005). Acceptance-based therapy for chronic pain is based on the Acceptance and Commitment Therapy model of psychopathology (ACT: Hayes, 2004; Hayes et al., 2006). In this model acceptance is related to the process of cognitive defusion, which attempts to change the way that individuals relate to their thoughts in order to diminish the unhelpful function of thoughts e.g. by teaching individuals to observe their thoughts dispassionately rather than trying to ignore or change them. In acceptance-based therapy learning the process of cognitive defusion should help catastrophisers become aware of but less distressed by the content of catastrophising thoughts, leading to less emotional distress. If acceptance is the underlying mechanism behind improvements after acceptance-based treatment for chronic pain, then one would expect the relationship between catastrophising and emotional functioning to be mediated by acceptance after ACT intervention.

An ACT/behavioural model of physical functioning in chronic pain?

The current study demonstrates a different pattern of relationships between illness representations and the processes of catastrophising and acceptance in relation to successful physical functioning. The path model in Figure 4 indicates that the relationship between representations of illness consequences and physical functioning is partially mediated by acceptance. The relationship between catastrophising and physical ability is also mediated by acceptance. These findings indicate that acknowledging that pain exists but engaging in activities despite this is more strongly related to successful physical functioning than negative cognitive processing. These results question the applicability of cognitive primacy models to physical functioning in chronic pain. In these models, such as the model of depression by Beck (1987), cognitive processes are essential components of disorder and negatively biased or distorted cognitive processes lead to negative affect and reduced engagement in activities. The current results instead suggest an ACT or broadly behavioural model of successful physical functioning in chronic pain.

It must also be noted, however, that representations of worse illness consequences (such as unemployment, financial loss, family stress or loss of social networks) and a belief that more symptoms are caused by the pain (illness identity) are also directly related to physical disability. Therefore appraisals about chronic pain are also relevant to successful physical functioning. Since the process of acceptance also mediates the

relationship between representations of consequences and disability, improving acceptance of chronic pain could somewhat reduce the effects of this type of appraisal on physical functioning.

The indirect relationship between catastrophising and physical ability via acceptance appears to contradict the social-communicative purpose of catastrophising, as surmised by Sullivan and colleagues. Sullivan et al. (2001) state that catastrophising has the purpose of ‘maximising the probability that distress will be managed within a social/interpersonal context rather than an individualist context’ (p. 60). If this is the case then increased catastrophising should be directly related to increases in self-reported physical disability because catastrophisers will aim to demonstrate high levels of disability to elicit more support from others. The mediating influence of acceptance does not make sense in this model. The role of acceptance as a mediating factor suggests that catastrophising occurs as part of a process of appraisal of ongoing pain sensations and that learning to accept the presence of pain can reduce the influence of unhelpful appraisal processes on physical functioning.

The relationship between acceptance and control in chronic pain

The finding of a moderate positive correlation between representations of control and acceptance is paradoxical. In the acceptance-based approach to chronic pain trying to control or reduce pain is theorised as being counterproductive when it does not lead to pain relief but continues to be the focus of the patients' efforts, moving them away from other valued aspects of their lives (McCracken, 1998; McCracken, 2005). However the control subscale in the Illness Perceptions Questionnaire-Revised (IPQ-R) is thought to refer to perceptions of empowerment. Control in the sense of personal empowerment is found to be one of the eight accounts of what it means to accept pain in the Q-methodological analysis of understandings of acceptance conducted by Risdon et al. (2003). The moderate positive correlation between control and acceptance in the current results can therefore be interpreted as suggesting that acceptance is related to trying to increase control over *the impact* of pain on daily life rather than trying to increase control over pain itself. This finding adds to understanding about the complex relationship between acceptance and control of chronic pain.

However, the correlational nature of this finding precludes any discussion of causality and whether increasing perceptions of personal control might increase levels of acceptance, or whether increasing acceptance through other strategies increases perceptions of empowerment. The correlational design of this study is shared by the majority of the other research studies in psychological factors in chronic pain. The

implications of this study limitation are discussed in detail later in this discussion section.

CLINICAL IMPLICATIONS OF RESULTS

The results of the study suggest that the effectiveness of psychological interventions for chronic pain could be improved by tailoring treatments according to whether the client's problems are thought to be related to emotional distress or physical disability or a mixture of both. The results highlight the importance of clinical assessment and formulation of presenting difficulties which takes into account both emotional and physical aspects of functioning. If the client suffers from high levels of emotional distress, the current results indicate that further assessment of pain catastrophising is important. Standard cognitive therapy techniques could be used to reduce catastrophising and thereby improve emotional functioning. Techniques might include recording and modifying catastrophic thoughts by looking for evidence for alternative viewpoints, highlighting positive aspects of situations and weighing up the costs and benefits of catastrophic thinking (Greenberger & Padesky, 1995).

ACT intervention might also reduce the impact of catastrophising on emotional distress. Acceptance-based therapy (ACT) has theoretical roots in relational frame theory (RFT) which suggests that trying to directly alter negative cognitive processes can increase their salience and functional importance and thereby worsen psychological difficulties.

Acceptance-based therapy is based on the notion that it is not the content of cognition but the process of interaction between cognition and the environment that leads to psychopathology (Hayes et al., 2006). Language and cognition can interact with the environmental context in a way that leads individuals to engage in behaviours that do not service their values and goals in relation to the environment. This is conceptualised as a form of psychological inflexibility. The core processes of ACT which include acceptance and cognitive defusion aim to increase psychological flexibility without unnecessary and unhelpful attempts to alter the frequency or form of private events or cognitive processes e.g. catastrophising.

The theoretical framework behind ACT is very different to cognitive-behavioural models of psychopathology. The cognitive model of depression by Beck (1987) suggests that distorted cognitive processes are key components of psychopathology and cognitive-behavioural treatments emphasise the need for direct cognitive change for successful therapeutic outcome (Beck, 1976). It will not be possible to conclude which types (ACT or traditional CBT) and aspects of psychological interventions are more appropriate in treating emotional distress in chronic pain until controlled intervention studies are conducted which examine how psychological interventions influence the relationships between appraisals, cognitive processes and emotional functioning.

The study results indicate the utility of examining levels of acceptance if clients have high levels of pain-related disability, since acceptance of pain may be the key element in facilitating successful physical adjustment. Helpful treatment strategies are likely to

include improving acceptance and willingness to experience pain using mindfulness and cognitive defusion, as well as more traditional behavioural strategies to reduce avoidance of painful situations e.g. encouraging engagement in activities using a graded exposure approach or behavioural experiments, activity scheduling, positive reinforcement and pacing activities.

The results also suggest that psychological interventions should attend to clients' perceptions of the consequences of their pain condition. Perceptions that the pain condition will more seriously affect one's life are directly related to poorer physical and emotional functioning. Cognitive interventions e.g. thought challenging and behavioural experiments may help modify these perceptions when they form an overly negative appraisal of the impact of chronic pain. Interventions to improve coping skills could help clients to adapt when their pain condition does have realistically perceived negative consequences e.g. job loss or loss of social networks.

The current results indicate that group treatment of chronic pain, whether it involves a behavioural, cognitive-behavioural or acceptance-based approach, should involve assessment of both physical and emotional functioning and clients should be allocated to interventions accordingly. Acceptance-based approaches are likely to be more effective for clients with high levels of pain-related disability while cognitive or ACT approaches may alleviate emotional distress. All treatments should involve assessment of individuals' perceptions of their chronic pain, in particular their perceptions of the consequences the pain has on their lives. Successful treatment is likely to involve

addressing the validity of these perceptions and intervening accordingly, either by improving coping strategies or by attempting to modify these perceptions.

LIMITATIONS OF STUDY

The overall consideration of the current findings must take into account the methodological limitations of the study. Firstly, the causal status of acceptance and catastrophising processes remain unknown. In their discussion of path analysis, Frazier et al. (2004) highlight several criteria for conferring causality. These criteria include temporal precedence of variables, which is sometimes but not always inherent in the type of variable (e.g. gender), or the type of design (a longitudinal study design). In itself underlying theory, however compelling, cannot satisfy criteria for conferring causality. This means that a path analysis with relationships between variables decided by theoretical reasoning cannot provide evidence that certain causal relationships exists even if the analysis explains a large amount of the variance between variables.

In the present study, the two path models provide valid descriptions of relationships between illness representations, catastrophising, acceptance and emotional and physical functioning in individuals with chronic pain who have by and large not undergone any psychological intervention. This data has interesting theoretical and clinical implications but must be interpreted with caution. For example in Figure 4 representations of illness identity, consequences and acceptance are directly related to physical functioning. This

may mean that modifying these illness representations and developing a more accepting attitude towards pain will improve physical functioning. However it is equally possible that having more physical disability reduces acceptance, has more serious social and economic consequences and increases the number of pain-related symptoms, leading to perceptions of increased illness identity and consequences.

This study limitation could have been overcome to a certain extent with a longitudinal design. Keefe et al. (2004) highlight the necessity of longitudinal designs in order to develop understanding about causal psychological mechanisms in disability and distress in chronic pain. Unfortunately a longitudinal design was not employed in the present study. One difficulty in carrying out longitudinal research is participant drop-out during the study. This was one of the considerations that influenced the use of a cross-sectional design in the current study. A cross-sectional and correlational design was also chosen because of time constraints and to maximise the number of participants and therefore the statistical power of the study.

Another limitation of the current study is the reliance on self-report measures of emotional and physical functioning. Ideally these measures would have been supplemented with more objective measures of functioning such as medication use, number of GP visits and work status. In terms of specific measures, total scores of the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983) were used as the measure of emotional functioning. The use of HADS total scores means that it is not possible to distinguish between appraisals and psychological processes that might be

differentially involved in anxiety, depression and other emotional difficulties in chronic pain. On the other hand the HADS, a brief and relatively straightforward assessment tool, provided a fast and reliable method of assessing emotional functioning in participants being asked to complete several other questionnaires at the same time.

The sole use of the Chronic Pain Acceptance Questionnaire (McCracken et al., 2004) as the measure of acceptance might also have biased results in favour of a strong relationship between acceptance and physical functioning. The CPAQ has been designed to measure chronic pain acceptance as described by McCracken et al. (2004) as involving ‘an active willingness to engage in meaningful activities in life regardless of pain-related sensations, thoughts, and other related feelings’ (p.6). This is a primarily behavioural definition of acceptance which is likely to correlate with levels of physical activity. However, this behavioural definition and questionnaire may not provide a full measure of what constitutes acceptance in chronic pain.

Risdon et al. (2003) derive eight accounts of everyday understandings of chronic pain acceptance. These are taking control; living day to day; acknowledging limitations; empowerment; accepting loss of self; more to life than pain; spiritual strength and not fighting battles that cannot be won. This study suggests that acceptance involves several processes other than engagement in meaningful activities. Risdon et al. (2003) particularly discuss identity changes in chronic pain and speculate as to whether successful acceptance involves managing loss of identity and other identity processes. The results of this study suggest that it would be useful to develop measures that

examine a broader range of the components involved in acceptance of chronic pain. It may be the case that other components of acceptance, e.g. empowerment or accepting loss of self, are more strongly related to emotional functioning and that these aspects of acceptance have not been detected by the measure of acceptance, the CPAQ, used in the present study.

Finally, in the current study participants were recruited with varying locations of pain, including back, neck and lower body pain. Two thirds of participants were female and pain severity and duration varied. Participants were also recruited from both Pain Clinic and voluntary sector settings. These characteristics of the participant sample mean that gender, pain severity and pain duration as well as the interaction between these factors and psychological variables may also have affected emotional and physical functioning. Differences in outcome between groups of individuals with different pain locations and conditions, e.g. fibromyalgia, as well as differences between those who attend clinical services and a general community sample, also remain unknown. On the other hand, the wide inclusion criteria meant that a large number of participants were recruited and that statistical power was achieved.

STUDY STRENGTHS

The high level of participant recruitment is one of the main strengths of the study. The data from 153 participants was included in the analysis and the return rate of questionnaires was 66.3 %. The main reason for this high return rate was probably the fact that questionnaires were personally given out to participants by the researcher with stamped addressed envelopes attached. The level of participant recruitment meant that statistical power for the analysis was easily achieved, and the results of the study can be interpreted more confidently as a result. In addition participants were recruited from three Pain Clinic sites and two pain support groups in different parts of the country. This breadth of participant recruitment means that the study results are not subject to undue influence from the particular patient characteristics of an individual recruitment setting. Moreover the mixed sample of chronic pain sufferers used in the study means that the results have high levels of generalisability to the general chronic pain population.

The study has another strength in that it specifically examines relationships *between* psychological variables in chronic pain functioning. Previous psychological research in this area can be criticised for focusing one psychological construct and overlooking potential interactions. The results therefore represent an initial step in the development of more comprehensive multi-factorial psychological models in chronic pain.

DIRECTIONS FOR FUTURE RESEARCH

As stated earlier, there is a pressing need for research on the interactions between psychological factors in chronic pain and particularly studies employing longitudinal and experimental designs. This research would help to develop theoretical models with greater validity and explanatory power. It would be useful to further investigate the relationship between catastrophising about pain and other cognitive-affective processes involved in the appraisal of threat e.g. self-efficacy, anxiety and worry. This research would help clarify the role of appraisal in theoretical models of chronic pain functioning.

More controlled intervention studies also need to be conducted to investigate whether modifying catastrophising or acceptance leads to changes in emotional and physical functioning, and whether these psychological variables act as operating mechanisms for these functional changes. It may well be that the relationships between psychological factors and functioning are different before and after psychological intervention e.g. increasing acceptance might be the operating mechanism for improving emotional as well as physical functioning during ACT intervention even though the present results suggest that catastrophising is the more important mediating process involved in emotional functioning before psychological intervention. This hypothesis could be tested by conducting path analyses on data from clients prior to and after ACT treatment for chronic pain. This would allow investigation of whether the pattern of relationships between psychological variables alters after intervention, with acceptance now

mediating the relationship between catastrophising and emotional functioning. Time-series analysis of clinical cases could also be used to examine which types and aspects of psychological intervention produce changes in physical and emotional functioning.

Research into acceptance of chronic pain would also be improved by expanding existing or new measures to incorporate assessment of other components of acceptance e.g. accepting loss of identity, living one day at a time. These aspects of acceptance may also influence successful functioning in chronic pain. In general, studies on psychological factors in chronic pain would be strengthened by using objective as well as self-report measures of functioning e.g. assessment of work status, sick leave, GP appointments and use of medication.

Finally, it is important to remember that any comprehensive theory of functioning will involve an interaction between psychological, biological and social factors and that joint research with different clinical disciplines is required to achieve this. First steps towards a truly biopsychosocial theory of chronic pain might include a comparison of the influence of psychological factors on outcome depending on pathology e.g. fibromyalgia, chronic musculoskeletal pain. Further investigation into the influence of social factors e.g. family functioning, socioeconomic status or perceived family support is also needed, as well as research into how social and psychological factors interact with each other. There has not been enough investigation into the variable, situation-based conceptualisation of catastrophising and it would be interesting to examine if

levels of catastrophising, as well as acceptance, differ depending on interactions with clinicians and the ways in which prognoses and treatment information are imparted to patients.

CONCLUSIONS

The results suggest that illness representations and the psychological processes of catastrophising and acceptance differentially influence emotional and physical functioning in chronic pain. These findings add to understanding of the interactions between psychological factors in chronic pain and question current theories that suggest the predominance of a single psychological factor e.g. pain catastrophising in successful overall functioning. The clinical implications of the results include the importance of tailoring psychological interventions to target different psychological processes depending on the clients' presenting difficulties. Further research is needed to substantiate these findings and advance psychological theory in this area.

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**APPENDIX 1: COPY OF LETTER CONFIRMING ETHICAL APPROVAL OF
STUDY**

**APPENDIX 2: COPY OF QUESTIONNAIRE PACK CONTAINING
PARTICIPANT INFORMATION SHEET, CONSENT FORM AND
QUESTIONNAIRES**